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URIC ACID

AN EPITOME OF THE SUBJECT

BY

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SECOND EDITION

PHILADELPHIA

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PREFACE TO SECOND EDITION.

THE call for a new edition of this book within two years is some evidence that it was needed. Since its appearance I have had nothing to recant. Many statements are daily made upon the subject of uric acid and its action or inertia in causation of disease; but the lapse of time has strengthened the positions I had previously taken, and has developed fresh evidences of their impregnability.

No one will, however, understand the matter who does not test it clinically. So long as a man is content with argument he will find nothing to distinguish one abstract opinion from another and will remain in doubt and difficulty. Only by action and observation can these be removed and my statements demonstrated.

This book is not put forward as con-

vincing in itself (the absence of detail precludes such a claim), but as an introduction to the study of a subject which must be practically dealt with before it can be grasped and utilised.

BROOK STREET, W.,
April, 1906.

PREFACE TO EPITOME OF URIC ACID.

THIS little book has been produced in response to a request from many members of the profession for a short statement which they could place in the hands of their friends or pupils to give them an idea what uric acid stands for to-day in clinical medicine.

I trust it may answer this purpose; but I would remind all who wish to get a really useful grasp of the subject that they must not only study the larger volume, but must repeat on themselves and their patients many of the observations there given. Only in this way can they really understand how uric acid controls the circulation, and all that depends on it from the day of birth to the hour of death, and has thus a far more powerful

influence than any other single factor in the causation of "disease."

This influence can to-day be seen in action, and those who wish to understand the matter must see it for themselves.

The fact that many troubles which have been dignified by special names are mere symptoms of food poisoning will then be self-evident.

7, Brook Street, W.,
May, 1904.

CONTENTS.

CHAPTER I.

PAGE

Outline of History 1

CHAPTER II.

Uric Acid, its Physical Properties and Peculiarities 26

CHAPTER III.

Uric Acid and its Effects on the Circulation and Metabolism... 35

CHAPTER IV.

The Collæmic or Circulation Group of Food Poisonings... 53

CHAPTER V.

The Local Irritation or Arthritic Group of Food Poisonings... 100

CHAPTER VI.

Uric Acid and the Clinical Worker ... 125

CHAPTER VII.

Prevention and Treatment of Food Poisoning 140

URIC ACID.

AN EPITOME OF THE SUBJECT.

CHAPTER I.

Outline of History.

It was in the year 1882 that I began to investigate the periodic headache from which I had suffered all my life, and from which up to that time I had not obtained any kind of relief. After numerous drugs had been given up in disgust, I began to try alterations of diet, and I eventually found that as I diminished the use of animal flesh I suffered less frequently and less severely. This headache had been for many years a serious matter, for during practically the whole of my student career both at Oxford and in London, I lost from one and a half to two days almost

every week in recovering from headache or from the powerful drugs used in treatment. Further, I may say it is certain that if I had not discovered its cause, it would some time ago have developed into its final stage, of Bright's disease, and thus probably before now have put an end to my life. It has been my lot to see not a few of my teachers and fellow-students succumb to the disease from which I found a means of escape, in discovering that it was not, properly speaking, a disease, but the result of mistaken and injurious foods, and that it was therefore still possible to retrace my steps. In consequence of the results produced by this diminished use of flesh foods, I was led into a series of experiments on myself and others, with regard to their effects, and these experiments led me to investigate the urine, and eventually to pay considerable attention to the excretion of uric acid. Further research brought out the important fact that the headache was always accom-

panied by a large excretion of uric acid in the urine. I soon found that not only the headache, but each and all of its concomitant symptoms bore exactly the same relation as the main symptom to the excretion of uric acid, and I further observed that by controlling the excretion of uric acid in the urine I could in all conditions control both the incidence of the headache and the appearance of its chief attendant symptoms. For instance, I found that when a headache was going on, together with a large excretion of uric acid in the urine, it was only necessary to administer a small dose of a mineral acid to diminish the excretion of uric acid in the urine and to clear up the headache, with all its concomitant symptoms, while, with this clearing up and accompanying diminution of uric acid in the urine, there very often appeared a fresh symptom, namely, a certain amount of pricking and shooting pain in some of the joints and fibrous tissues of the body. A little further investi-

gation sufficed to show that what I had just discovered in the case of this periodic headache (migraine, or as I now call it the "uric acid headache") was but one instance of a general law, and that it was in my power, with acids and numerous other substances, to diminish at any time the uric acid in the urine, and so to cure headache and all similar conditions, while it was equally in my power to increase the uric acid in the urine by giving a solvent alkali, and to produce headache and its concomitant symptoms by so doing. Briefly, I had discovered that by the administration of solvents of uric acid, on the one hand, or precipitants of uric acid on the other, I could make the excretion of the uric acid in the urine from day to day or from hour to hour exactly what I pleased, and that in altering this excretion I altered all the symptoms which had been found in relation to it.

I had thus come in sight of the fact that uric acid is directly or indirectly the

cause of headache and of the conditions that grouped themselves round it, and also the cause of a certain amount of pain in the joints or fibrous tissues; this pain being but a minor degree of the troubles long known as gout and rheumatism. We see here, in their simplest terms, the two great classes of uric acid diseases; firstly, those which, like the headache, are due to its excess in the blood (excess in the urine being a symptom), and secondly, those due to its excess in the joints or fibrous tissues, of which its remarkable diminution in the blood and urine is a symptom. In fact, I soon believed (what I have since been able to prove) that the explanation of my results could only be that there was an excess of uric acid in the blood at the time when it was passing in excess into the urine, and that there was but little uric acid in the blood at the time when it was present in very small quantity in the urine. Further investigation of the periodic head-

ache, its history, concomitant symptoms, and reaction to treatment, brought out the fact that it may be said with certainty to be due to high blood pressure. Not only was it found that the pain was aggravated by every kind of movement which would raise blood pressure, but it was affected by posture, such as stooping (which increases blood pressure in the head), and improved by the vertical posture, standing or sitting straight upright, while it was again relieved or even reduced to nothing by pressure on the arteries of the neck, thus restraining the force with which the blood was driven into the vessels at the base of the skull. Such being the character of this headache, the question arose as to its connection with excess of uric acid in the blood, and in the urine, and the natural suggestion seemed to be that the uric acid might in some way irritate either the vaso-motor centre or the peripheral vaso-motor nerves and, by causing contraction of the minute arteries, bring about such a rise of blood

pressure as to produce the results which appeared.

It then gradually dawned upon me that, directly or indirectly, uric acid controlled the circulation of the whole body, and produced high blood pressure on the one hand, or low blood pressure on the other, according to the amount present in the blood and circulating fluids. But I was still in doubt as to the way in which uric acid produced this effect, whether by acting on the vaso-motor centre, on the peripheral vaso-motor nerves, or in some other way, and for a time I was unable to get further, though I found that uric acid, in explaining for me the causation of the headache from which I suffered, had given me also a complete explanation of a very large number of disease processes which grouped themselves round that headache, in a natural grouping, due to the fact that they, with the headache, were results of one common cause.

Among the diseases thus grouped was

Raynaud's disease, of which I shall have a good deal to say further on. But I found, on reading up Raynaud's writings, that he had noticed there was a very marked slowing of the capillary circulation in the skin, so that if a white patch were produced by pressure on the surface, in normal conditions the blood would return into it in two or three seconds, but that in his disease a white patch similarly produced would remain more or less white for a considerable time, and the blood might not return for as much as twenty or even thirty seconds. Believing then, as I had come to do, that Raynaud's disease was nothing but one of the circulation effects of uric acid, it struck me that if in this case there was such a difference between the rate of the capillary circulation in the skin as has been above mentioned, in slighter conditions of uric acid trouble we should probably meet with similar alterations in the capillary circulation, differing merely from this great fluctuation in degree; and I

at once set to work to see whether this was the case, examining the question both in physiology and in pathology. In the case of physiology, and to some extent in pathology also, I produced all the various fluctuations I was accustomed to produce in the excretion of uric acid, and (as I believed) in the amount in the blood, and I soon found that every fluctuation so produced was accompanied by a quite obvious and distinct fluctuation in the rate of the capillary circulation. I therefore saw that what Raynaud had discovered in his disease was but one instance of the general law that uric acid controls the capillary circulation of the whole body, and that this capillary circulation is slower the more uric acid there is in the blood, and quicker the less uric acid there is in the blood, while the uric acid which passes in the urine is practically an index, both to the amount of uric acid in the blood, and to the rate of the capillary circulation.

Obviously uric acid, by thus controlling the capillary circulation, was the cause

of the high blood pressure, which was in turn the cause of the excessive pressure in the skull, and so of the pain and of the periodic headache from which I suffered. So far all was perfectly clear; the reason why I suffered from the headache was because my blood pressure was too high, the reason why my blood pressure was too high was because my capillaries were contracted or obstructed by the uric acid, and this explained the excess of uric acid in the urine which I had first noticed, because it was only when there was excess of uric acid in the blood that there was also an excess of this substance passing into the urine. I was not long in discovering that practically in all conditions, both in physiology and pathology, the amount of uric acid in the urine was an absolute guide to the amount in the blood, and that blood drawn in conditions such as those of Bright's disease, or cerebral hæmorrhage in pathology, and during the use of alkalies or salicylates in physiology,

always showed an excess of uric acid; while, on the other hand, blood drawn in conditions of fever, or during the administration of precipitants of uric acid when the excretion in the urine was scanty, always showed a very small quantity of uric acid. At this point my research was very greatly helped by the discovery of Mr. Barker-Smith, that uric acid granules could be precipitated in the blood by chloride of ammonium, and that instead of having to draw blood in very considerable quantity, and to work at it by extraction and by chemicals for twenty-four to thirty-six hours to obtain a record of the quantity of uric acid that it contained, this could now be done approximately, but still with very considerable accuracy, in from ten to thirty minutes. All that it was then necessary to do was to draw a minute drop of blood from the tip of the finger or the lobe of the ear, to mix small quantities of the solutions with it, and to examine it under a microscope at the end of a given period

of standing. The number of granules precipitated in the blood by the solutions was soon found to be an absolutely correct index of the amount of uric acid in the blood, and this quantity I found could be gauged with practically absolute accuracy, by taking the relation of the precipitated granules to the number of red cells in a given quantity of blood. This was a most important discovery, for it was now possible to see and control everything in reference to uric acid and the circulation, in the space of a few minutes. Instead of having to collect twenty-four hours' urine and estimate it with care, and the expenditure of thirty to forty minutes in time, one could directly draw a small quantity of blood, and, in ten minutes, tell approximately under the microscope the amount of uric acid it contained. By the help of this process I could see that it was not even necessary to draw blood, for the capillary reflux (as I call the returning capillary circulation which Raynaud had investigated) was an

absolute index of the amount of uric acid in the circulation, and could be observed by any one in less than one minute of time. The field had now cleared itself in all directions and there was no longer any possible room for doubt, both as to the causation of the periodic headache or of any of its concomitant symptoms, or again of the arthritic symptoms which the uric acid produced as the headache was being relieved.

Any third year's student can now observe the presence and approximate quantity of uric acid in the blood. He can demonstrate that the quantity varies with slow or quick capillary circulation, and that this variable capillary circulation similarly goes with low or high blood pressure; that with the low blood pressure you get the arthritic and fibrous tissue irritation which shows that uric acid is being deposited in these tissues and cleared out of the blood, and that with the slow capillary circulation and high blood pressure you get all the group

of so-called diseases, headache, epilepsy, mental depression, vertigo, and the whole collæmic group due to its effects on the circulation. These, it is now obvious, are not, strictly speaking, diseases at all, they are results of the action of a single substance, and that single substance though formed in the body to some extent is not in normal conditions produced in such amount as to be harmful. It is only when, to the quantity of this substance formed in the body, we add an equal or greater quantity already formed in the foods which we eat and thus introduce, that it comes to be present in the circulation or in the tissues in amounts sufficient to produce serious disturbance. I have therefore ceased to speak of these disturbances as diseases, though in the chapters which follow I shall mention them by their usual names so as to make it clear to what I am referring. But it will, I am sure, become more and more evident that we are dealing in all these matters

not with diseases, but with the results of food poisoning.

At this point we were still in doubt as to the way in which uric acid obstructed the capillary circulation and raised the blood pressure, but it very soon became evident, as will be shown in later chapters, that the only complete and satisfactory explanation of these facts was that uric acid obstructed the capillaries directly by its presence in the blood in the form of a colloid, which, hindering the capillary circulation in millions of tiny capillary vessels, obstructed the flow from the arteries into the veins very greatly, and thus whenever there was a strong heart behind it caused a more or less distinct rise of blood pressure. It will be seen later on that this effect of uric acid explains a number of facts which are quite inexplicable, on the theory that uric acid may affect the vaso-motor centre or the peripheral vaso-motor nerves.

We see that my sufferings mentioned above were but one instance of a uni-

versal law, and that when the law is known the practical and theoretical explanation of the suffering becomes complete. Since I first made this discovery I have got much further, for I now know that no one swallows uric acid with impunity—in every one it slows the capillary circulation, thus altering the metabolism and combustion of the body, producing anæmia, and, if the heart is strong, high blood pressure and its results. Again, in those who, like myself, are now moderately free from it, practically every grain of uric acid swallowed can be seen as it passes through the blood from its effects on the circulation. Thus three grains of uric acid taken at lunch to-day will visibly slow the capillary circulation in the evening and for some hours of the following morning. But those who are more or less full of uric acid both in circulation and tissues must not imagine that so small a dose of uric acid will have visible effect, for there is already so much in their blood that

three grains hardly makes any noticeable addition to it or any distinct alteration in the rate of their circulation; this experiment to succeed perfectly must be made on a person who is pretty nearly free from excess of uric acid. If, however, a large dose of uric acid is administered instead of a small one, quite an opposite effect is produced. If, in place of 3 grs. of uric acid, 30 are given, either as pure uric acid or as a corresponding amount of flesh or pulses, the solvent powers of the blood for uric acid are overpowered, a uric acid filter is set up in the liver (see Ch. II.) and the result is that the blood in place of being flooded with uric acid is more or less cleared of it. Hence we have a diminished excretion of uric acid in the urine, a quickened capillary reflux, and more or less stimulation of combustion and metabolism, and this is accompanied by a feeling of strength and power as if a tonic had been taken, which is not extraordinary, for all tonics have the effect of

clearing the blood and thus producing a temporary well-being.

This is the explanation of the results I obtained by injecting urates into animals when I found that their blood, shortly after injection of large quantities, contained almost none. This also explains the stimulating effect of a meat diet, of urine, beef tea and meat extracts, and of a whole host of drugs, stimulants, acids, and spa waters, for all clear the blood of uric acid and cause its retention in the liver and other organs, and this effect can to-day be seen in the corresponding change in the capillary circulation, for retentives quicken capillary circulation and solvents slow it.

Later on, however, if the excessive administration ceases, the solvent powers of the blood for uric acid again increase; it begins to take up and dissolve the stores and accumulations in the liver, and the results are collæmia and depression, slow capillary reflux and excessive excretion of uric acid in the urine. And this demon-

strates the dangerous and insidious action of uric acid, for it first produces a stimulation which is mistaken for strength, and later causes a corresponding or more than corresponding depression only to be counteracted by taking more of the poison in tea or coffee, or by calling in other stimulants such as opium, cocaine, alcohol or tobacco, which act in the same way and temporarily clear the blood, only to flood it later with larger and larger quantities.

If, however, the blood has been prepared beforehand by administration of solvents, it at once holds in solution the incoming uric acid, there is no uric acid filter set up in the liver, and we get at once collæmia, slow circulation, defective combustion, and depression in place of stimulation. And all these results can be reproduced and varied day by day and hour by hour in any one, simply by taking care to control *the solvent powers of the blood as well as the introduction of uric acid.*

Here we have the effect of stimulation plainly set before us; we can see why, as meat eating has increased in the last thirty years, tea, alcohol, and tobacco have shown a corresponding increase; we can understand why it is impossible to give up any one stimulant without giving up all; for whatever stimulant may be continued accumulates uric acid in the body, this resulting in subsequent depression and a call for more stimulants. We can also see why salicylates, which clear uric acid out of the body, make it comparatively easy to dispense with stimulants, for they remove the cause of depression. As I have said in "Diet and Food," all stimulation is wrong; at best it calls out the reserves, and thus leads to physiological bankruptcy, with degeneration of function and structure; but to call out the reserves with a poison like uric acid, which is sure to cause subsequent depression, is simply to invite disaster. In a word, alcohol is bad, but tea and uric-acid-containing stimulants

are worse. In the last ten years I should estimate that I have treated at least five or six hundred cases of the periodic headache, and in the same period I cannot have seen much less than five thousand cases of various other uric acid poisoning troubles, which, indeed, are visible everywhere, for no one swallows uric acid with impunity, and yet every one does swallow it in ordinary foods.

My blood pressure now is from 100 to 120 mm. of mercury; it used to be from 130-150; my capillary reflux is from 5-6 half seconds, and it used to be from 7-8; and my blood decimal is now ·75 to ·8; and it used to be ·5-·55.[1]

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[1] NOTE.—To make these figures comparable to the results of the standards in use to-day, ·3 must be added to each. Then ·8 will become 1·1 and ·55 will be ·85, &c. This is partly because the blood of the uric acid free is above the standard accepted by flesh-eaters, and partly because the standard of colour by which I did my original work was too dark (see "Uric Acid," seventh edition).

Hence, as I have pointed out in "Uric Acid," and shall repeat in the chapters which follow, only those who live as I live get a blood colour or a capillary circulation which can in any way compare with my own, and, except in those who have followed my example and teaching, I have never seen these conditions reproduced. Practically all consumers of animal flesh are relatively anæmic, and have a visibly slow circulation in the skin which any one can demonstrate in a minute; and, as I have above said, in those who are free from uric acid the phenomena of its excess in the blood can be reproduced at any time by swallowing a known quantity of uric acid in a condition of chemical purity. So that there is not only no room for doubt as to cause and effect, but all can see its result in the circulation and can produce changes in this for themselves in any direction. Thus the main point can be demonstrated by any one in a few hours, and the presence, even the amount,

of uric acid in any food can be demonstrated and even approximately calculated from the effect which swallowing that food produces on the capillary circulation. Several of my followers have told me that they now use this test to enable them to distinguish between foods which are free from xanthin and those which are not; but this again can only be done by those who are moderately free from uric acid.

We have seen, in this chapter, that the investigation of a form of periodic headache (migraine) showed that it was associated in time with a large excretion of uric acid in the urine. It was then observed that the large excretion of uric acid in the urine was the index of its presence in excess in the blood, and it was also found that the headache in question was directly due to high blood pressure. Later on the connecting link between these two facts appeared in the discovery that uric acid in the blood, by obstructing the capillaries all over the body, was the cause of the high blood pressure.

And this has also been clinched by clinical experience in many hundreds of cases (I see at the present time more than forty to fifty new cases of headache every year), extending over the last eighteen or twenty years, the summary being that if you discontinue the foods containing uric acid or xanthin and thus introducing it into the body, you will cease to suffer either from the headache itself or from any of its concomitant symptoms having a similar causation.

The phenomena can now be demonstrated, their causation followed from moment to moment, or hour to hour, and all can see that they have been suffering, not from disease, but from food poisoning, for the disuse of these foods removes the symptoms and results, which, however, can be reproduced at any time by swallowing either the omitted foods or uric acid itself in a state of chemical purity.

In the same period I have seen quite a number of my relatives, friends and colleagues killed by these insidious poisons

—a fate which would certainly have been my own had I not ascertained the facts as to uric acid and its mode of action. I see many round me to-day, who still know no better and are steering for a similar fate in ignorance of its causation.

CHAPTER II.

URIC ACID, ITS PHYSICAL PROPERTIES AND PECULIARITIES.

I MAY say briefly that my researches show that uric acid is always formed in the body in a definite quantitative relation to urea (about 1 to 35), and probably it is so formed, and is a by-product of the formation of urea. It follows from this that a person who forms 350 grains of urea a day forms also 10 grains of uric acid. This uric acid generally passes out of his body day by day without difficulty, unless he adds on to it other 10 or more grains contained in the food he eats, which I shall mention further on. In this case he may overpower his ability to hold uric acid in solution and excrete it, and retention in the body is thus produced with all the subsequent troubles.

The chief point that we have to notice with regard to the physical condition of uric acid itself is its insolubility. It differs very greatly from urea in the fact that it is only soluble to a very small extent in water, and that this solubility is therefore affected to an important extent by quite a large number of substances which form insoluble compounds with it. The blood circulating in the human body is in certain conditions a good solvent of uric acid, and will hold a moderate quantity of it in solution. In other conditions it is an extremely bad solvent of uric acid and will hold but little in solution; though practically speaking the blood of the body is always alkaline, and alkalies as we know are solvents of uric acid. Hence the blood in the human body is always to some small extent able to dissolve uric acid, and uric acid is always present in the blood; but the amount of uric acid present is increased by the administration of solvents, and is diminished by the administration of sub-

stances which either diminish the alkalinity of the blood, or add on to the blood a substance which directly forms an insoluble compound with uric acid.

Uric acid has one further peculiarity which we must bear in mind and which accounts for a whole series of phenomena that it produces in the living body, and this is its very great power of attracting to itself any particles of its own substance. It has for a long time been known that a comparatively small quantity of uric acid thrown into a solution such as urine containing uric acid will, in certain conditions of acidity of that urine, very quickly clear all the soluble uric acid out of it, so that the urine in a short time ceases to hold any uric acid in solution. On the other hand, if the urine has been previously mixed with alkali, a little solid uric acid thrown into it will not take any uric acid from solution in the urine, but, on the contrary, the urine thus rendered alkaline will take into solution further uric acid from the fresh supply.

The phenomena to which I am here referring have been dealt with by me at great length in the book of which this is an epitome, and I will only say here that it is possible on the one hand by throwing a little powdered uric acid on a filter and pouring a urine twice quickly through it, to abstract from that urine almost every particle of uric acid which remains in combination with the solid uric acid on the filter. On the other hand, if alkali is added to the urine before it is passed through this so-called "uric acid filter" it will not add any deposit to the solid uric acid but, on the contrary, will take up a very considerable amount of fresh uric acid into solution.

This is a very important property of uric acid, and it is one which we must bear constantly in mind, because it is extremely probable that the blood and tissue fluids of the body all react in very much the same way as the solutions of uric acid of which I have been speaking. That is to say, when they are only

slightly alkaline they tend to give up uric acid to all deposits of uric acid in the tissues; but when they are highly alkaline, or, for any other reason, good solvents of uric acid (*e.g.*, administration of salicylates) they do not add uric acid, but, on the contrary, take it up in solution from all the deposits in the tissues of the body. During life there is a constant throwing out of uric acid from the blood into the tissues, or, on the other hand, a resumption of uric acid from the tissues into the blood, and we must remember that this is constantly going on from hour to hour and day to day in the body.

In the morning hours, the blood is a good solvent of uric acid and takes it up from all the deposits. In the evening hours, the blood is a bad solvent of uric acid and tends to throw it out from the blood on to the deposits already to be found in the tissues. This is the reason why the great collæmic group of uric acid diseases is most marked in the morning

hours and in the warm season of the year when the blood is in the best condition for holding uric acid in solution, and why the great local group of uric acid diseases and all forms of arthritis are worse in the evening hours and in the cold season of the year when the blood is in the worst condition for holding uric acid in solution. Those who bear these simple facts in mind will find that they explain an ever increasing number of the processes of the body which otherwise were inexplicable. It follows from this that those who have extensive deposits of uric acid in their tissues will have great difficulty in passing out day by day all the uric acid they form, because in passing through the blood it is very liable to be caught up and retained in the existing deposits if at any time the alkalinity of the blood is temporarily diminished. Hence those who have extensive deposits must keep their blood constantly in a condition to dissolve more uric acid than it contains, if they are to avoid adding to

deposits instead of diminishing them, and we see here one of the factors which will cause considerable variation in the length of time required to clear the body of uric acid.

There is another fact that we must bear in mind with regard to uric acid, and that is its power of producing local irritation in the tissues. Several investigators have injected uric acid either in suspension or in solution both into their own tissues and those of animals, and they have all shown that such uric acid produces local irritation of the tissues at the seat of injection. They have also shown that this irritation is increased by the administration of certain drugs by mouth, and diminished by the administration of certain other drugs, and, without going into great detail, which I desire to avoid in this book, I may say that the local irritation produced by uric acid is increased by the administration of solvents and diminished by the administration of precipitants, from which, and from many

other facts, I conclude it is with uric acid in solution that we have to deal in the temporary irritation which we may have in the joints and fibrous tissues. On the other hand, every pathologist knows that he often meets with solid deposits of the biurate of soda lying perfectly quiet and harmless in the tissues, and not surrounded by the smallest evidence of recent irritation.

Uric acid or its equivalent (xanthin) is contained in all animal flesh, probably for the same reason that it is contained in the tissues of man. Roughly speaking, meat, fish, fowl, game, and eggs may be said to contain about 6 to 8 grains to the pound. Xanthin is also contained in many vegetables, and in some of these (as peas, beans, lentils, pea-nuts, Cashew nuts, asparagus and mushrooms) there is more than in meat, even up to 12 or 16 grains per pound. Hence the sufferings of horses and of the natives of India from uric acid poisoning. Theine, caffeine, theobromine, the alkaloids of tea, coffee,

cocoa, and chocolate are also xanthins, so that tea contains 175 grains to the pound, and the other substances somewhat less, but still a great deal. These substances are, however, practically absent from the foods which will be mentioned in the last chapter as the proper diet of man. The troubles mentioned in this volume and usually called diseases, are simply food poisonings, and even a cursory consideration of the foods mentioned above will show how continuous is the intake of these poisons in ordinary diet, and to what an extent this has been and is being carried in our own and neighbouring nations. In recognising how great are the forces making for derangement of function and degeneration of structure thus brought into play by our ordinary habits of eating and drinking, it must surely appear absurd to any reasonable mind to endeavour to escape from the effects of uric acid poisoning while steadily pouring it in with every meal that is eaten.

CHAPTER III.

Uric Acid and its Effects on the Circulation and Metabolism.

By metabolism is meant the changes in the tissues of the body which produce from the food we swallow the heat and force we evolve. For all essential purposes the human body is like a fire; it is, in fact a machine for converting a certain amount of force derived from the sun, and latent in food, into visible heat and energy once more. This burning up or metabolism of the human body is essentially dependent upon the circulation, because, in the first place, it is the circulation which carries into the tissues of the body the oxygen and foods which make combustion possible, and in the second place, it is the circulation which removes from the interstices of the tissues the waste products or ashes

resulting from combustion. It follows that, as this process of metabolism or combustion is so intimately and essentially dependent upon the circulation, combustion will be better and more complete, or slower and less complete, according to the completeness or incompleteness of the circulation, and it is at this point that the influence of uric acid, in controlling the capillary circulation of the whole body, comes into play. For obviously, if the capillaries are obstructed by uric acid, the oxygen required is not so freely taken up from the atmosphere, it is not so freely and completely carried to the tissues, the effects in the tissues which constitute this essential combustion of the body are more slowly and languidly carried out, and, lastly, the waste products and ashes from the seat of combustion are more slowly and less completely removed. As the result of all these actions the total effect of uric acid on the combustion of the human body is very great, and those conditions (which we have long been

accustomed to call "disease processes,") associated with excess of uric acid in the blood, can all be grouped together in one category as more or less distinct failures of combustion. The total effect of an excess of uric acid in the blood is like that of a wet blanket on a fire, like an extinguisher on a flame, or like shutting the flues and cutting off the draught of a stove.

With the knowledge now available it is possible to gauge in a few moments the rate of combustion and its completeness or incompleteness in any given body. The normal rate of the capillary reflux, as has already been mentioned, is from two to three seconds, or, as I prefer to record it, five half seconds. The abnormal rate of the same reflux, which corresponds to varying excessive quantities of uric acid in the blood, may be anything from 6, 8, 10, 12, 14 half seconds up to the very slow return originally observed by Raynaud of 30 seconds or 60 half seconds, so that if 5 half seconds is the normal

rate of return, it is possible to meet with a return which takes twelve times as long to be complete.

In the next chapter we shall have to enumerate the names of the diseases (so called) which have their origin in the defective combustion which uric acid produces. In all these conditions you will find a capillary circulation which yields a capillary reflux of more than five half seconds, and the slower that reflux the worse is the combustion in the body.

It must also be obvious to those who understand the first principles of the circulation that when uric acid is obstructing the capillaries all over the body, its effect in obstructing these capillaries and slowing the circulation and combustion of the body will be increased if the central power of the circulation, that is to say, the heart, is in any way weakened; for the circulation in any given set of capillaries obviously depends upon two factors (1) the power of the heart to force the blood forward, and (2) the power of the uric

acid to obstruct this passage from the arteries through the capillaries into the veins. The result of these two forces acting against each other is the high blood pressure in the intervening vessels, *i.e.*, in the arteries, which was the cause of the periodic headache from which I suffered, and which led me to undertake this investigation. But if the heart is originally weak, or diseased, or fails and dilates and gives up the struggle against the obstructed capillaries, it must be, I say, obvious to those who understand first principles, that the capillary circulation will become still worse the weaker the heart gets, and that between obstruction by uric acid on the one hand, and failure of the heart on the other, the circulation and combustion of the body may eventually come to a complete standstill, and this standstill means, of course, if it is prolonged for more than a moment or two, the death, disintegration, and destruction of a part or of the whole body in which such a condition

obtains. So that in dealing with the great defective combustion group of so-called diseases we have always to bear in mind these two factors, obstruction by the uric acid in the capillaries, and the power or weakness of the heart. Conversely, when the blood is clear of uric acid the fire of the body burns up brightly; you have only got to clear the blood of uric acid to make a capillary reflux of 12 or 14 half seconds change at once into one of 4 or even 3 half seconds, and when the fire thus burns up the temperature rises, the excretion of waste products goes up with a bound, and the fire burns as brightly and completely as it previously smoked and smouldered.

It may then truly be said that all substances which increase the solvent power of the blood for uric acid are (so long as there is plenty of uric acid available) causes of slow capillary reflux, defective capillary circulation, and defective combustion throughout the body. On the other hand, all substances that diminish

the solvent powers of the blood for uric acid or directly form insoluble compounds with uric acid quicken the capillary circulation and improve combustion throughout the whole body. We have here an epitome of the whole field of uric acid influence. All the diseases or so-called diseases associated with excess of uric acid in the blood are diseases of deficient combustion; on the other hand, those associated with an extremely small quantity of uric acid in the blood are diseases of too rapid combustion; while the conditions associated with a normal small quantity of uric acid in the blood giving a capillary reflux of five half seconds represent normal combustion and normal temperature of the body. With defective combustion the following concomitant phenomena occur, we have slow capillary reflux, and (if the heart is strong) high blood pressure; we have certain signs and altered sounds in the heart itself, showing when it is acting against high blood pressure. We have as a result of

defective combustion subnormal temperature on the surface of the body, though the temperature may be raised inwardly (because the effect of the obstruction by uric acid is to shut the blood into the deeper parts), and we have further a defective formation of all the products that result from the combustion of the body. Thus there is a diminished formation of urea (the end product of the metabolism of albumen); a diminished formation of acids which are the end products of the metabolism of many of the salts, sulphur, phosphorus, &c., which the food contains; and we may have as further results of the same cause an excessive excretion of sugar and of albumen. In other words, the albumen which should have been burned up and metabolised in the body into urea, acids, &c., has failed to get itself burned in the body and is being excreted from the kidneys as albumen more or less unchanged. The sugar which in similar conditions also passes

out by the kidneys is simply that sugar which has failed to get itself burned up owing to the defective combustion, and which remains either in the blood or passes out by the kidneys in exactly the same way as the albumen does. When there is defective combustion of fat or of phosphorus and sulphur, we get a storage of fat in the tissues of the body which produces obesity, and we get an excessive excretion of phosphorus and sulphur which sometimes appear in the urine in altered forms, one at least of these possibly giving rise to the formation of deposits in the urine. These conditions may now be recognised, not as diseases (as they have long been miscalled), but as results of that defective metabolism or combustion of the human fire, which, preventing the burning up of all those substances, prevents also the production of the normal ashes produced by their combustion, and furnishes us in place of these normal ashes with an imper-

fectly combusted substance. This substance may be either passed out in the urine as albumen or sugar, or it may be retained in the tissues as fat, or in the urinary passages as cystine. All these defects of circulation go, as I have said, with defective combustion and subnormal temperature. The smouldering fire will not produce a normal amount of heat and thus the temperature of the body is always, in these conditions, one or two degrees below normal, and this subnormal temperature is always more marked in those hours of the day when there is most uric acid in the blood (namely, the morning hours), and less marked in those hours of the day when there is less uric acid in the blood (namely, the evening and night hours). The conditions, on the other hand, which are associated with more or less complete absence of uric acid from the blood, are associated also with a somewhat raised temperature, which we call fever. In fever, something, as for instance a

microbe, has formed an excess of acid which diminishes the alkalinity of the blood and clears it of uric acid, and the combustion of the body is immediately increased. The temperature registered by our thermometers is the mere result of this combustion, which is again the result of the freedom of the blood from uric acid. It is possible by means of drugs at any time to produce a condition of deficient combustion in which the blood is loaded with uric acid, and then, by giving drugs which form insoluble compounds with uric acid, to clear the blood quickly, and as the blood is cleared the temperature will rise at least one or two degrees. But as Nature in these matters is more powerful than man, when she produces (it may be as the result of an invasion of microbes) a rise in acidity or a diminution of the alkalinity of the blood which clears the blood of uric acid, the rise of acidity is greater and the quickening of combustion is much

more marked, so that we may then get a rise of temperature, not only of one or two degrees, but of five or six degrees. What I want to make clear is that these are mere results of the removal or failure to remove uric acid from the blood. In physiology, and in pathology, and throughout life from the day of birth to the hour of death, the combustion of the body is regulated by the amount of uric acid contained in the circulating fluids, and it is in our power by controlling the amount of uric acid, by clearing it out of the blood by means of precipitants, or by bringing it into the blood by means of solvents, to produce any change in any direction with reference to the metabolism and combustion of the whole body.

We have seen in this chapter that uric acid produces two effects: (1) defective combustion when it is present in the blood in excess, and (2) local irritation when it is driven out of the blood into the tissues,

and it is now apparent that we are not dealing with the so-called diseases, albuminuria and Bright's disease, glycosuria and diabetes, Raynaud's disease, obesity or cystinuria, but with the origin of them all, namely, defective combustion due to excess of uric acid in the circulation. We have one condition only to fight against and the means for fighting that condition (or, better still, of preventing its origin) are quite simple. Similarly, gout, rheumatism, rheumatoid arthritis and all fibrous tissue irritations are not diseases, but, like the defective combustions previously mentioned, are the results of food poisoning.

For the purpose of getting a bird's-eye view we may roughly classify uric acid diseases in two groups as follows:—

A.—The local or precipitation[1] group due to the irritating presence of uric acid

[1] Called also the uric acid filter group, for each local precipitation acts the part of a uric acid filter to the blood and tissue fluids of the rest of the body.

in a fibrous tissue either in solution or suspension (colloid form) as in gout.

Gout.

Rheumatism.

Morbus cordis (inflammatory).

Local inflammations of all fibrous tissues, some of which are to be found in the—

Brain and meninges.

Nose, pharynx, larynx, trachea, bronchi, lungs and pleura.

Stomach (gastralgia, gastritis, gastric ulcer), liver (liver abscess and cirrhosis, jaundice) and peritoneum.

Ovaries, uterus and pelvic fasciæ, uterine fibroma and other fibromata, epididymis, &c.

Fasciæ and fibrous tissues in neck, back, spinal cord and lumbo-sacral region, hands, &c.

Other fibrous tissues in the body, as of skin (eczema and psoriasis fibromata).

Intestines, cæcum, and appendix (flatulence, colic, enteritis, colitis and appendicitis).

Muscles (myalgia).

Nerves (neuralgia).

Teeth coverings (periostitis).

Uric acid plus microbes acting together as in—

Catarrh, influenza, phthisis, pneumonia and malaria (its fever and sequelæ).

Glands, irritation and fibrosis of (not pyæmic).

B.—The circulation or solvent group, due to excess of uric acid in the blood (collæmia), and its effect on the circulation, blood pressure, combustion, and nutrition, as—

Headache, epilepsy, convulsions, chorea, hysteria, neurasthenia, nervousness.

Mental depression, excitement, mania, insanity.

Bodily depression, fatigue, lethargy.

Vertigo, syncope, insomnia.
Periodic paralysis, chronic paralysis.
Asthma.
Dyspepsia—dilated stomach.
Congestion of the liver, glycosuria, diabetes.
Bright's disease, albuminuria, hæmoglobinuria, dead hands, cerebral hæmorrhage, cramps, dropsy, uræmia.
Gravel and calculus.
Neuritis.
Retinitis.
Cerebral degenerations.
Spinal degenerations.
Skin diseases as—
  Atrophy (with microbes) ulcerations, boils.
Raynaud's disease.
Diseases of vessels—
  Purpura, thrombosis.
  Degeneration, atheroma, calcification.
  Aneurism, morbus cordis (collæmia acting with strain, dilatation and

defective nutrition), angina pectoris.

Diseases of blood—

Anæmia, chlorosis.

Hæmoglobinæmia.

Leucocythæmia.

Pernicious anæmia.

Graves' disease.

Menorrhagia and uterine congestion, dysmenorrhœa.

Piles, pruritus ani et vulvæ.

The origin of all these diseases and the plague of words they bring with them is ignorance: the sole cure is knowledge of cause and effect properly applied.

When the cause is known we can express the above in two words—

A. Group = Gout

B. Group = Collæmia.

Gout is relieved by solvents; collæmia by retentives. Both are prevented, relieved, or wiped off the record, by a uric-acid-free diet.

Gout is accompanied by quick circula-

tion, raised temperature, and few granules in the blood.

Collæmia is accompanied by slow circulation, sub-normal temperature, and many granules in the blood.

Both are results of excess of uric acid in the body, produced by swallowing it in the food.

There are some, I believe, who deny this statement, but it is open to them to place the matter beyond doubt in a few hours, if they wish to do so.

Most physiologists acknowledge that flesh contains xanthin, and I have shown that xanthin is physiologically equivalent to uric acid; so that if those who doubt will swallow xanthin, taking care to keep their blood in a condition to dissolve the resulting uric acid, they will easily, though perhaps unpleasantly, convince themselves that they are taking poison, and a poison which produces exactly the effects of which we have been speaking.

CHAPTER IV.

The Collæmic or Circulation Group of Food Poisonings.

In this chapter I will deal at somewhat greater length with those troubles due to excess of uric acid in the blood and associated with the results of this excess, namely, defective circulation. If uric acid blocks the capillaries in the way that it is supposed to do, it is probably present in the blood stream in the condition of colloid or gluey material similar to the colloid and gelatinous urate of silver which is formed in Haycraft's process for the estimation of uric acid and which so blocks the filter that it is sometimes impossible to produce proper filtration, even with the powerful aid of a suction pump. Indeed, it was the fact that so much suction power was required to effect filtration which showed me that the influence of

uric acid on the capillaries was probably mechanical and due to its colloid particles blocking, or obstructing, these tiny blood paths. This being so, I have been led to refer to this action of uric acid in the circulation as collæmia, thus indicating the presence of uric acid as a colloid in the blood stream and its action as an obstructor of the tiny capillaries. As we have already seen, the immediate effect of obstructing the capillaries is to cause a rise of blood pressure between the capillaries thus obstructed and the heart which is doing its utmost to drive the blood forward. We may divide the collæmic troubles into groups according as they are due to (1) high blood pressure in the arteries, (2) the difficulties which the heart experiences in driving the blood through the capillaries, (3) the obstruction in the capillaries themselves, or lastly, (4) that defective combustion of the fires of life resulting from the defective circulation in the capillaries all over the body. We will take in the

first place those due to high blood pressure, if only for the reason that the periodic headache, which is the chief of these troubles, is pre-eminently the great central pivot of the collæmic group, as most of the other troubles are mere exaggerations of some of its symptoms. The headache, like many pains elsewhere, is practically the result of pressure, and this pressure is due to the high blood pressure in the arteries at the base of the brain, communicating itself to all the structures in the vault of the skull cavity. The result of this upward and outward pressure is that the circulation in the cortex of the brain and in the membranes which cover it, is very greatly obstructed, and, partly as the result of the upward pressure, partly as the result of this venous and capillary obstruction in the cortex we get eventually quite important congestion, especially in the veins and venules of the brain, and ultimately this may go on to the outpouring of a certain amount of serous fluid into the interstices of the brain

membranes, which again increases the pressure and the difficulty in all directions of carrying on the circulation (uræmia). The periodic, or uric acid headache (migraine), is thus a mechanical result of the obstruction of the general circulation, with its special local effects in the closed, or partially closed, cavity of the skull and membranes. The other effects of this altered circulation in the skull cavity (the etiology of which is practically identical with that of the headache we are speaking of) may now be shortly mentioned. The more important of these are epilepsy (which in very many points resembles the headache just discussed), mental depression (which has a practically identical causation), vertigo, and certain kinds of aphasia and amnesia; mental excitement and mania also are results of identical conditions when these are complicated by heart weakness or heart failure. In all these troubles, with the exception of the two last named, we find in addition to the slow capillary reflux, which is the index

of excess of uric acid in the blood, a relatively strong heart and a raised blood pressure.

Among other conditions which acknowledge a causation practically identical with that of the uric acid headache are chorea, hysteria, neurasthenia, nervousness, and insomnia. Among more serious conditions I may mention uræmia and coma, and as a proof that the latter has a similar causation to that of the uric acid headache, may be given the clinical fact that those who emerge from coma very generally complain that they have a severe headache. The coma of which I am speaking is but an aggravation or further stage of the high blood pressure and defective intracranial circulation which produce the headache. Then there are various paralyses due to defective circulation in the spinal cord, affecting various portions of it according to anatomical or physiological determining factors, and there are certain degenerations which similarly affect portions of the brain, and

are the results either of the defective intracranial circulation of which we have been speaking, or of those changes in the brain membranes which the circulation changes bring about. Or again, they are results of the defective circulation in the cortex of the brain produced by continued obstruction by uric acid, more or less complicated by failure of heart power. In reference to this explanation I may mention the clinical fact that severe high blood pressure headache is by no means infrequent in the early stages of what afterwards develops into general paralysis of the insane. The headache corresponds with the stages of defective circulation when the heart is strong and the blood pressure high, and the general paralysis due to degeneration of the cerebral cortex follows as the result of the still more defective circulation and defective nutrition which supervene when collæmia is complicated by more or less heart failure.

Among external signs and symptoms of collæmia I may mention especially the

puffy condition of the skin, which has a smooth or watery appearance as though it contained an excess of interstitial fluid, which is in fact the case; and we meet with all varieties in the quantity of this interstitial fluid in the skin, from slight puffiness, often most marked in the lower eyelids, up to obvious œdema and general dropsy. There are some interesting points with regard to the characters of the collæmic face; that is to say, the face of a person who suffers from collæmia and all the troubles which its presence over weeks, months and years has produced. First of all there are the puffy skin and œdematous eyelids of which we have spoken, then there is an undue prominence of the eyes, which again is the result, as I have pointed out, of high blood pressure, and here we get all degrees of prominence of the eyes up to the most marked exophthalmos of fully-developed Graves' disease; these alike being mere results of the chronic high blood pressure of collæmia. Other characters of the

collæmic face are the watery œdematous and shiny condition of the front of the eyeball, commonly called "Bright's bright eye" because it is so often met with in Bright's disease. As I have elsewhere pointed out, it is often easy to read in the face not only that its owner suffers from collæmia, but the period of his suffering, and it is possible to make a fairly accurate guess at the height of the blood pressure, and whether that blood pressure is now greater or less than five or ten years ago. Thus, a man with puffy face and prominent eyes and whose hair is still untouched by grey, has probably a strong heart and a blood pressure of 180 or even 200 millimetres of mercury. See the same man in five or ten years' time; his eyes are now less prominent, though his skin is no less puffy, and under his eyes there are great loose folds of œdematous eyelid which once covered an eye which was more prominent than it is now; his hair has become distinctly

grey, his heart muscle has also become somewhat feeble, and though the capillary obstruction produced by collæmia is no less than it was five or ten years ago, the heart has less power, the blood pressure is less high, and this is the reason why the eyes are less prominent. Of such a man it is safe to say that the blood pressure has been higher than at present, and that if five or ten years ago it was 180 or 200 millimetres of mercury, it is now only 150 or 160, because the heart is no longer able to keep up the higher pressure. In this way it is possible to read in the patient's face no small part of the life history of his circulation. And the same may be done in cases of Graves' disease, where, as the heart fails and dilates, similar changes in the prominence of the eyes and in the blood pressure of necessity ensue.

There is one disease of the eye itself which has almost certainly a similar or identical relation to high blood pressure, that is glaucoma. The causation of glau-

coma has long appeared to me to be practically identical with that of the uric acid headache, the blood pressure acting in the closed or partly closed cavity of the eyeball just as it does in the closed or partly closed cavity of the skull. In both cases we must bear in mind that there are other factors of anatomy and physiology which determine the effects of the blood pressure. But in both cases also the trouble is essentially due to high blood pressure, and in its absence would not occur at all. There are also some interesting facts which seem to show that the more common errors of refraction due to the length or shortness of the eyeball bear a very similar relation to high blood pressure, and it is possible that the hypermetropia of old age is, at least in part, one of the results of the falling blood pressure which old age occasions; for with lower blood pressure the globe of the eye will probably become less distended and the distance between the refracting media and the retina will be diminished. Similarly it is probable that

in myopia the extent of the error is increased by things which raise the blood pressure, as this will tend to distend the eyeball and increase the distance between the refracting media and the retina. And the onset of myopia in young people whose muscle and heart power are increasing is thus the converse phenomenon to the hypermetropia of those enfeebled by age.

We now come to the troubles associated with the effect of collæmia on the heart itself, and these may be shortly stated to be due to the difficulty which the heart encounters in forcing blood through the obstruction opposed to it in the capillaries. When we bear this fact in mind we have no difficulty in understanding the resulting heart troubles, some of which there is no space even to mention in a short treatise like the present. The conditions which first directed my attention to this matter, and which indeed were partly personal, are those corresponding to a certain amount

of faltering or fluttering on the part of the heart, which might either drop out a beat entirely, or add on an irregular extra beat in its effort to overcome the obstruction in front of it. This is, as a rule, a mere functional condition and an evanescent one, but we can see that if the condition described, namely, the collæmic obstruction of the capillaries, does not quickly cease, one of several things must of necessity happen. Either the heart must continue to falter and flutter and act irregularly, or, it must grow stronger and more muscular, and with increased power eventually force blood through the capillaries in spite of the obstruction; or, finally, it may give up the struggle, its muscles may dilate and degenerate, the fibrous pericardium itself may yield and bulge either locally or generally, and the heart will in this way be practically destroyed as a functioning organ.

So long as the early symptoms continue the condition is functional, and can

be comparatively easily remedied. If the heart hypertrophies and continues to hypertrophy and force blood through the capillaries, we have to deal with the condition of ever rising and increasing blood pressure, and so long as this goes on the patient is getting into ever greater and greater danger of the rupture of some vessel or set of vessels. If this rupture takes place in a practically unimportant organ such as the nose, a little epistaxis may give timely warning of the changes which are going on; but if the rupture unfortunately takes place in one of the great vessels buried in the substance of the brain, more or less serious or fatal apoplexy may be the result. On the other hand, if the heart gives up the struggle, its muscle must of necessity be less well nourished; it will degenerate and dilate more quickly, the fibrous pericardium will also degenerate and become distended, and we have at once before us the final causes of such troubles as angina, or œdema and general dropsy

preceded by a more or less marked condition of congestion. Lastly, we come to the effects of obstructed circulation in the capillaries themselves, and, more important still, in the organs and structures in which these capillaries are situated. The effects here may be summed up in two or three lines as follows: (1) The general effects on the body as a whole, which are best expressed by the words "defective combustion," of which defective combustion, albuminuria, glycosuria and obesity are the great types, (2) the local effects on the organs in which the most defective capillary circulation is to be met with; and the organs which will thus be affected are determined chiefly by anatomical concomitant conditions. For instance, in Raynaud's disease, it is the surfaces and extremities, as he has pointed out, which are most affected; the surfaces, because they are most affected, by external cold (for external cold is a precipitant of uric acid); and the extremities, because they

are furthest from the heart, and the power of the heart is transmitted to them through the longest and smallest lines of arteries; they are furthest from the power which drives the blood, and nearest to the cold which precipitates the colloid uric acid and thus aids the obstruction of the capillaries.

I will now shortly mention some of the most important organs which are thus affected by the defective capillary circulation which colloid uric acid produces in their tissues. First of all, the skin; the effects of defective circulation in the skin are chiefly that it becomes dry and harsh and rough, is inclined to ulcerate and slow to heal, and is often affected by chilblains. We get in this way all varieties and aspects of defective skin nutrition up to that most obvious and terrible of surface troubles, the Raynaud's disease, of which I have already spoken, or the dry and wasted skin of chronic Bright's disease. This (Raynaud's disease) is a very good instance of

the fact that we have to deal with some trouble which has a local effect and is not dependent on the nerve distribution, for when a nerve is distributed to a deep part and to a superficial part Raynaud's disease is limited to the surface and does not affect the deep part, for the simple reason that colloid uric acid is precipitated in the vessels of the superficial parts by the cold to which these are exposed, while it is kept in better solution in the vessels of the deeper parts which are less exposed to cold. If Raynaud's disease were, as some have maintained, a disease of the nerves, it should affect the limb right through its thickness and not be limited, as we know it to be, to superficial parts and to extremities. The action of uric acid locally, as a colloid obstructing the tiny capillary vessels, will explain this disease and its incidence completely; but no possible action of uric acid on the vaso-motor centre will explain all the facts of the case. Then, again, it is difficult or impossible to believe that the muscular

tissue in the walls of small vessels (to take the vital theory of the causation of Raynaud's disease) can possibly remain contracted and shutting out the blood till it and the surrounding structures have passed into gangrene; but it is easy to see that the mechanical uric acid obstruction theory presents here no difficulty, for cold is a precipitant and heat is a solvent of uric acid; hence, the more the circulation slows in any extremity, the more it is exposed to the action of cold, and the greater the quantity of colloid uric acid precipitated the greater the obstruction to the circulation, till eventually it comes to a complete standstill and the part passes into gangrene. The one causation explains completely all the phenomena of Raynaud's disease and its limitation to surfaces and extremities; the other explanation it is simply impossible to realise. As the result of the defective capillary circulation in the lungs we get, as I have pointed out, a defective excretion of water in the air

exhaled from the lungs, and I have further stated that I can make this excretion practically anything I please from moment to moment by controlling the amount of uric acid in the blood. The disease especially associated with the alteration of the capillary circulation in the lungs by uric acid is that known as asthma, but it is quite evident that this again is but another result of the excess of colloid uric acid, and when the colloid uric acid has been shut out by diet the asthma diminishes and disappears. In the abdomen we have a large number of conditions, all of which are due to defective capillary circulation in the important digestive organs, but I have no space here to do more than enumerate them and make a few general remarks. It must, I think, be obvious to every student of physiology that when the stomach is digesting a meal, or the intestines are digesting or absorbing the results of digestion, or when the liver is metabolising the products brought to it

from these organs, all of them will perform their functions more slowly and less perfectly when their capillaries are obstructed by uric acid. When that obstruction is serious, and still more so when the heart fails more or less completely to overcome that obstruction, I have pointed out in my larger book that quite considerable quantities of various chemicals may be placed in the stomach (for instance) under these conditions, and that for several hours, while the collæmic circulation continues, they may be neither absorbed into the blood nor excreted from the blood into the urine, results which in the normal condition of affairs are usually completed in ten or fifteen minutes. It is obvious then that the effect of collæmia on all these important digestive organs is to slow their circulation, and to greatly delay or render imperfect all their functions. The chief results to be mentioned are dyspepsia in its many forms, liver troubles, liver congestion, or the disease, which the public calls "chill

to the liver," or "liverishness;" throughout the whole digestive canal there is a lowered power of food conversion, a great slowness of food absorption, shown by a falling excretion of urea and of acids in the urine, and a general slackening of the digestive metabolism of the whole body. Among secondary results of continued defective circulation and congestion in the digestive organs I may mention piles and pruritus.

I will now pass on to another organ, the kidneys, where the effect of collæmic circulation is again most important, and has furnished me with some most conclusive evidence as to the effects of uric acid on the circulation of the body. One of my first observations was that with the large excretion of uric acid which accompanied the uric acid headache the excretion of water from the kidneys was always small; conversely, I found that with the small excretion of uric acid which accompanied the opposite conditions of

freedom from headache, the excretion of water from the kidneys tended to be large. In other words, when the excretion of uric acid from the kidneys was large the amount of colloid uric acid blocking the kidney capillaries was great, and it was impossible for much of the water present in the blood and tissue fluids to pass out of the body. But when the amount of uric acid in the blood and urine was small, the blocking of the kidney capillaries was also insignificant, and the water was able to pass out freely from the blood and tissue fluids. The first condition, together with heart failure, is the cause of all dropsy, and the second condition, together with more or less good heart power, is the cause of all diuresis.

I very soon found that my observation with regard to the excretion of urine in the uric acid headache was but one instance of a general law, that in every one the urine tends to be scanty in the morning hours because there is more uric acid in the blood, and profuse in the night

hours because there is less, and that just as I can control the excretion of water from the lungs, so I can absolutely control the excretion of water from the kidneys; which is done merely by controlling the amount of uric acid in the blood, and consequently by bringing about the presence or absence of more or less obstruction in the capillaries of the kidneys. It must be fairly obvious that what I have said of the excess of uric acid in the blood and its excessive passage from the kidneys accounts for all the phenomena of the chief forms of gravel and calculus. Of albuminuria, glycosuria, cystinuria, I have nothing to say here, for they are not diseases of the kidney, but diseases of general metabolism and combustion; and in so far as the structure of the kidneys eventually becomes diseased and degenerated in these conditions, this is the mere result of the passage of the foreign albumen, or the excess of sugar through the urinary passages. These diseases (albuminuria, glycosuria, and cystinuria)

are diseases of the whole body, and their effects on the kidney are of comparatively little importance; in any case they are secondary, and results, not causes. The changes in some of the other organs, as, for instance, those in the pelvis due to defective capillary circulation, may be referred to in a few words; they are congestion of various organs as the result of high blood pressure, and dysmenorrhœa and menorrhagia are the chief results of these conditions. Again, we may have certain results of defective circulation in the muscles, such as fatigue and cramp. These are quite simple results of the defective circulation, and are chiefly due to deficient supply of food products on the one hand, and deficient removal of waste products on the other, so that œdema and congestion result from defective circulation and undue pouring out of serous fluids, which, as I have previously shown, occurs in the same way and under similar conditions in the membranes of the brain.

With regard to fatigue, I have shown that it is proportional to the good or bad circulation in the muscles and nerve centres, and that the good or bad circulation in these structures is proportional to the amount of uric acid in the blood—that is, to the collæmia. I have further shown that fatigue is accompanied by a fall in the excretion of urea, while exercise without fatigue is accompanied by a rise in the excretion of urea. Hence fatigue increases with every increase of uric acid in the blood, for uric acid in the blood slackens the circulation in the muscles and prevents combustion of albumens with their normal production of urea and force. When the circulation is slightly blocked we get slight fatigue with a diminishing excretion of urea; when the circulation is greatly blocked we get more and more severe fatigue with diminishing urea and it may be the presence of albuminuria. The albumens, which should have been broken up in the muscles into urea and other substances

with the production of force, have not been so broken up, but remain in some excess in the blood and so pass out by the kidney in the form of albumen. The reason urea falls is because the albumens are not being properly metabolised; and if that failure of metabolism is carried still further, we get the albumens themselves appearing in the urine in place of urea, and we get as results all stages of lethargy, depression and fatigue up to more or less complete collapse; the whole of these being results of the defective circulation, combustion and metabolism in the muscles.

In the nerves, again, the great nerve trunks and the peripheral nerves, we get certain changes as the results of defective circulation, and among these I have merely space to mention retinitis, hæmorrhage in the retina, and neuritis.

It follows that the accumulated result of all these changes in the circulation and nutrition of tissues and organs, pro-

ducing congestion, or alternatively free and efficient circulation, must tell upon the functions of gestation and parturition. And this is the case, for those women who have had practical experience of the uric acid free diet assert unanimously that the suffering and dangers of the processes of reproduction are diminished to an extent which deserves the most serious consideration.

I have already said much about Raynaud's disease, and there is one other collæmic trouble which bears an interesting relation to it, namely, paroxysmal hæmoglobinuria, for this, like Raynaud's disease, has the clinical characteristics of excess of uric acid in the urine, and all the signs of excess of this substance in the blood. As I have suggested, paroxysmal hæmoglobinuria is but an exaggeration of the effects which uric acid produces in the blood itself. Whereas moderate quantities of uric acid acting in more or less physiological conditions produce a fall in the quality of the

blood during the day, when there is most uric acid in the circulation, and allow a rise in the quality of the blood in the night, when there is least uric acid passing through the circulation, so under certain more severe conditions, and under the presence of a very large quantity of uric acid in the blood (often more or less aided by the effects of external cold, such as exposure to cold with insufficient clothing, washing the hands in cold water, or plunging them into iced water) the effect of this severe collæmia is apparently the destruction of a very large number of blood cells in the circulation itself, and the consequent passage into the urine of a corresponding amount of albumen and blood colouring matter, and this is paroxysmal hæmoglobinuria as we know it in this country. Its interest in connection with Raynaud's disease is simply the relation of both to a common cause. But there is one fact with regard to paroxysmal hæmoglobinuria which is of special importance, and leads us to the causation

of a further series of disease processes; I refer to the increase in the coagulability of the blood which occurs when the red cells are being broken up in the circulation by the collæmic storm. But an increase in the coagulability of the blood is one of the causes, probably the chief cause, of thrombosis, and thrombosis, as will be evident to all those who are well acquainted with clinical medicine and pathology, has long been known to occur exactly in those conditions in which, as we now know, a great excess of uric acid is to be found in the blood. Thus the relation between gout and thrombosis has long been ascertained. In the same way it is well known that thrombosis frequently follows certain fevers, such as enteric, and this thrombosis always comes in the collæmic period, which succeeds the fever, and is, as I have pointed out, its result. Again, thrombosis is common in Bright's disease, in which, as we all know, there is a constant excess of uric acid in the blood and most marked collæmia. Further, we

can see that if uric acid blocks the capillaries mechanically as a colloid, some of the blocking colloidical particles may from time to time be carried through the capillaries into the veins, and if they are not at once dissolved in these latter vessels they may become fixed in some portion of a vein and there give rise to the beginning of a thrombus, which may be the first stage of a more or less extensive thrombosis.

There is one other condition which the collæmic circulation may also, I think, easily explain, and that is purpura, in the skin and elsewhere. If uric acid is a mechanical cause of blockage in certain capillary vessels, we can quite easily understand the way in which it may give rise to purpura. If (say for a short time) a given capillary vessel is absolutely blocked by uric acid granules the circulation through that vessel ceases and the vessel is badly nourished, so that its cells become abnormally soft and porous, and may begin to disintegrate. If, then, owing to warming

the affected part, or to any other cause which clears up the collæmia, the blood is once more turned on through this affected capillary, it is almost certain that it will not merely pass through the capillary but will leak at various points into the surrounding tissues, forming the minute hæmorrhages which we have called purpura. We can now see why purpura affects chiefly surfaces and extremities, and in extremities is often limited to the surface most exposed to cold, also why its onset is marked by a normal or subnormal temperature. What we have already said about Raynaud's disease applies word for word here. I have no doubt that other things in the blood stream besides uric acid may produce a similar disintegration of capillary vessels, and pave the way for a similar leaking of blood, but the intimate relation which is often found between purpura and other collæmic or distinctly uric acid diseases, *e.g.*, acute rheumatism, seems, I think, to

show that purpura is more often due to uric acid than to anything else. Then the drugs used in treatment are such as either strengthen the heart (arsenic, the most useful drug in another collæmic disease—chorea), or clear the blood of uric acid (turpentine): in either case they improve the capillary circulation.

Lastly, we come to the effects of collæmia on the vessels and vascular system, and I may say in a few words that its effect is to expose them to long-continued high pressure and strain, to intensify the difficulty with which the circulation is carried on in all directions, and the pressure under which every exertion of the body is made, and therefore to increase the strain on every part of the vascular system between the blocked capillaries on the one hand, and the pulsating heart on the other. And I believe that all the changes we find in the vessels, such as atheroma, degenerative changes causing irregularities, and eventually even calcification, are the practical results of two

things: (1) the pressure and strain of which I have been speaking as the result of collæmia, and (2) the defective nutrition in the vessels themselves, because the vasa vasorum are, like all the other vessels in the body, obstructed by the collæmia. These simple considerations account, I believe, completely for the frequent association of all forms and stages of vascular degeneration with high blood pressure conditions, such as are most frequently met with in chronic Bright's disease. And we can now easily understand that those who have this collæmia or this chronic Bright's disease will more easily suffer, and suffer more severely from the effects of bodily exertion and strain which produce in their vessels altered nutrition and degeneration, in the heart dilatation and degeneration, and in either heart or vessels more or less local dilatation or aneurism.

The final summing up of all collæmic diseases, or that change of metabolism which is due to excess of colloid uric

acid in the blood stream, is defective combustion, and this is the result of the influence of defective circulation in the skin, digestive organs, muscles, liver, kidneys, nerves, and also in the brain and sympathetic system. Now this defective combustion may affect the albumens, in which case there will result diminished formation of urea, an excess of albumens in the blood and the passage of more or less albumen into the urine.

I soon found out that the uric acid headache might be accompanied by temporary albuminuria, and that this temporary albuminuria always corresponded with, or soon followed the time of most defective combustion. In the same way defective combustion may affect the sugar in the body and, leaving it uncombusted, produce a falling off in the excretion of carbonic acid from the lungs and an increase in the excretion of more or less unaltered sugar from the kidneys. A similarly defective combustion of fat or of sulphur may produce either of the con-

ditions of which I have already spoken. You have merely to prolong the defective combustion which produces albuminuria or glycosuria, and to increase its intensity, to find yourself in the presence of Bright's disease, or of diabetes, and there are found in Nature all intermediate conditions between the first trace of albumen which occurs only along with headache up to that constant and excessive albuminuria which is found in the most advanced Bright's disease. Similarly there are to be found in Nature all intermediate conditions between the first trace of sugar in the urine (which again is not infrequently to be found along with headache, or very similar signs of defective combustion), up to the large amount of sugar which characterises the fully developed diabetes. These simple considerations explain the important fact that in Bright's disease the albumen is always most in quantity in those morning hours when there is most uric acid in the blood, and less in those hours when with less

uric acid in the blood there is the most complete combustion which that particular body is capable of producing. And if in any case you can clear the blood of uric acid you can quickly reduce the albumen to a trace. Precisely similar conditions explain the well-known fact that a case of diabetes can eat, say, two or three ounces of toast and perhaps also some fruit, in the evening hours without increasing excretion of sugar, but if these things are taken in the morning hours, when collæmia and obstructed circulation are greatest, they produce always a well-marked and immediate rise in the excretion of sugar. Understanding that glycosuria and diabetes are results of defective combustion, we have no difficulty in seeing why their most severe condition, diabetic coma, should so commonly be accompanied by one sign of defective combustion, namely, subnormal temperature, while diabetic coma is, as I have pointed out, commonly preceded by a marked fall of urea, another sign of the

same thing. Further, I have shown that if by the administration of easily metabolised food, urea can be got to rise again, coma may, for a time, be averted. There are many minor points in both these troubles which are more completely explained by regarding them as defects of combustion connected with the circulation results, produced by uric acid, than by any other explanation which has been given, *e.g.*, their relation to the increased combustion of fever, which generally diminishes both sugar and albumen. Many people acknowledge that these riddles are not yet completely solved, and if the solution is achieved I am sure it will only be when they are regarded as results of defective combustion of which uric acid is the cause.

In speaking of the effects of uric acid on the great digestive viscera, on the muscles and on the skin, and in causation of defective combustion eventuating in albuminuria, glycosuria, &c., we come in contact with another very important effect,

namely, its influence on the metabolism and eventually on the structure of the blood. Probably its influence here is identical with its influence on the sugars and albumens, which at times and in certain portions of the body, are constituents of this circulating tissue. In any case, the fact remains that the quality of the blood itself and the quantity of hæmoglobin present in relation to the number of cells it contains are absolutely and entirely dependent upon the amount of uric acid circulating in the blood stream. Much may be said as to the exact viscera, liver, intestinal glands, spleen, &c., in which uric acid exercises this influence; but the facts are of more importance than their theoretical explanation, and in this outline I content myself with merely pointing out that I believe all forms of anæmia are due to this action of uric acid on the metabolism of the blood itself, and that all methods which have ever been used with success for the cure of anæmia have had the power of clearing the

blood of uric acid. That is to say, they have antagonised the action of uric acid in producing the collæmic group of food poisonings of which anæmia is one, the fact being that no one who swallows uric acid meal by meal has such good blood as those who refrain from it. Further, the ingestion of a known quantity of uric acid produces a definite fall in the quality of the blood, and this quality can be shown to be affected in one direction or the other by any drug which affects the quantity of uric acid present.

Lastly, it is an undoubted fact that just as the capillary circulation varies from morning to evening with the amount of uric acid passing through the blood (slowing in the morning to six half seconds and quickening in the evening to four or five half seconds), so does the quality of the blood itself alter from morning to evening, for it is better in the morning when it has just passed through a period in which there is least uric acid in the blood, and worse in the evening when

it has just passed through a period of the day when there is most uric acid in the blood. Similarly there is an annual fluctuation, in which winter corresponds with night and summer with day, and therefore the blood of those who take the xanthin-containing foods is at its best towards the end of winter, and at its worst towards the end of summer. The diurnal fluctuation is only a matter of 2 or 3 per cent., but the annual change is a matter of 7 to 10 or even 15 per cent., according as the condition of the body as to power and function favours retention or collæmia, that is as the physiology of the body aids or antagonises the effects of winter or summer respectively. Hence the improvement in blood colour from winter retention is most marked in the young and strong, and the falling off from summer collæmia is most marked in the old and weak. The same reasoning explains the well-known increase of slackness, debility, lethargy, melancholia and suicidal mania

in spring, and their diminishing incidence in autumn. There is, indeed, this seasonal increase and diminution of all the troubles connected with uric acid collæmia. These are the actual facts, and I must refer to my larger work for the explanation which it is now possible to give of other interesting points. Of the fact that uric acid controls the metabolism of the whole body, including the metabolism of the blood and all its constituents, there is no room for doubt.

Finally, I will say one word about the collæmia which is the cause of all the forms of food poisoning mentioned in this chapter. The chief signs of this collæmia are slow capillary reflux and the high blood pressure which is its result. The capillary reflux is an absolute index to the amount of uric acid in the blood, and the results it gives can be controlled by examining the blood itself and estimating the amount of uric acid contained, or by collecting the urine for examination. They all tell the same

tale; they all agree with the explanation I have given. It is therefore possible to tell in one moment, merely by touching a person with the point of the finger and watching the rate at which the capillary circulation and the colour return into the whitened area, whether he has a large or small amount of uric acid in his circulation, whether he suffers severely from collæmia and uric acid food poisoning, or does not so suffer. In making this test there is only one thing to be borne in mind, which is, that with the same amount of uric acid in the blood, the weaker the heart, the slower the capillary reflux, and it must therefore be remembered that where the heart is obviously weak or diseased, a part of the slowing of the capillary reflux must be put down to this cause, and that the quantity of uric acid in the blood will prove to be less than the capiliary circulation alone would have led us to expect. On the other hand, we may be practically certain when we see a capillary reflux

on the front of the chest (about the level of the heart) of three, or at most four, half seconds that we have to deal with the condition of fever, and that we shall find few granules in the blood, and little uric acid in the urine. Lastly, for those whose circulation and tissue fluids are moderately free from uric acid, it is possible to swallow three or four grains of pure uric acid and to watch this passing through the blood, and indicating with absolute certainty the hours of its passage by the slowing of the capillary reflux which it then produces.

The net result of this extensive failure of circulation is undoubtedly to produce physical degeneration. As I have pointed out in "Diet and Food," the first effect of collæmia on the muscular system and on athletic activity is fatigue; for obviously those muscles will continue to work longest which have the best supply of food products brought to them, and the quickest removal of their waste products. Now the circulation controls

both these factors. In relation to athletics, therefore, the effect of an excess of uric acid in the blood stream is much the same as if in working a machine we were to pour sand into the bearings in place of oil. The result, of course, is to bring about increase of friction, much loss of power, and an early failure on the part of the athlete with regard to endurance. And this is the simple explanation of the fact now so often observed in those whose blood is moderately free from uric acid (a condition sometimes met with in the so-called vegetarians), namely, the way in which they are able to outlast meat-eaters in matters of endurance and in the continued production of force; a fact to which recent trials both in England and Germany have borne important testimony. It is really only necessary for any one to touch the skin of two competitors and watch the rate at which the colour returns into the whitened patch to say which of them has least friction in his machinery, and therefore will win in a trial of strength and endurance.

But if we prolong this condition of defective circulation for days, weeks, months and years, and remember that it applies not only to the muscles and nerves, but to every tissue, organ and function in the body, and that its action is continuous, or almost continuous, day and night, can we have any doubt that this continuation of friction and defective circulation must lead to the general failure of physical power which we call degeneration? Can we doubt when this condition has been in force in the great nerve centres for weeks, months, and years, that we have to do with consequent mental degeneration and mental blindness, and that as the result a moral degeneration naturally follows? I may say shortly that, in my opinion, many of the existing nations, mistaking stimulation for strength and using increasing quantities of injurious foods, have as a consequence degenerated in an unmistakable manner, and only the mental blindness, which is a direct result of excess of uric acid in the blood,

has prevented recognition of the cause. Stimulation, as I have shown ("Diet and Food," Ed. v., p. 119), is not strength, but merely a calling out of the reserves, and when all the reserves have been called out physiological bankruptcy of necessity ensues. Hence, those who begin with meat which is a stimulating food, pass on to the more powerful stimulants, tea and coffee, and from these to alcohol, opium and cocaine, as stronger stimulants are needed to call out the remaining reserves and keep the ever-impending collæmia at bay; so that when further stimulation is no longer possible, function and structure collapse. From which sequence it may be concluded that stimulation, if persisted in, invariably leads to disaster. Physical degeneration is to be seen in all directions from my standpoint, for none of those who take meat and stimulants come up to my standards of blood colour or of blood circulation. As the result of this physical degeneration we get all stages of mental weakness and

most forms of insanity, and mental and moral blindness are but minor degrees of the latter. The fact must be recognised that as regards these diseases we are on the down grade. Their ratio is not to-day what it was yesterday, and the contrast between the present state and that of ten years ago is marked. The increased ingestion of these special poisons produces cumulative effects, recognisable not only in the prevalence of insanity, and the nation is going down calamitous ways. It should be remembered that the wear and tear of modern life, with its perpetual worry and anxiety, tends also to raise blood pressure and thus to intensify the dangerous effect of collæmia upon the heart and vascular system, causing congestion of important viscera, such as the liver and spleen; whilst accumulating evidence indicates that some part of the increase of diabetes and other diseases of these organs may be traced to this cause. Worry and anxiety not only augment collæmia but are themselves reacted upon by the

physical condition, and thus a vicious circle is established. From the hand of any person, or better still from the front of his chest exposed in an opening in a screen, being otherwise completely ignorant of him, I would undertake to tell, to a very large extent, from the numbers indicating the circulation rate, what the physical, mental and moral nature is likely to be. For the man who has slow capillary circulation is bound to be lethargic in body, and this in turn reacts upon the mind and all the moral qualities. These considerations are of far-reaching importance, and the nations which hope to survive cannot too quickly or too completely understand and act upon them.

CHAPTER V.

The Local Irritation or Arthritic Group of Food Poisonings.

In the last chapter we dealt with the effects of uric acid in the circulation; in this chapter we are dealing with the effect of uric acid on the fibrous tissues of the body outside the vessels. The troubles in the last chapter were accompanied by slow capillary circulation and high blood pressure; these are accompanied by quick capillary circulation and low blood pressure, because when uric acid is outside the blood and collecting in the tissues, there is little colloid uric acid in the circulation, and the capillary circulation is therefore free and the blood pressure low. The temperature, which in the previous group is very frequently subnormal on account of deficient combustion, is, in this group,

very often normal or slightly raised, according as combustion is normal or abnormally increased.

Where the local irritation produced by uric acid is at all severe and extensive, the local metabolism and, consequently, the general metabolism are decidedly quickened, and the combustion of the whole body is increased, producing fever.

Such a local irritation produced by the precipitation of uric acid on a given area, may occur anywhere throughout the body where fibrous tissue is present, and, in mentioning the troubles which this local irritation may produce I shall have to speak of all the most important fibrous tissues in the body. To begin with the skin, we get troubles which have been spoken of as eczema and psoriasis, and various forms and conditions of irritation in fibrous tissues increasing up to a definite fibrous tumour (fibroma). In the head we may get irritation in any fibrous tissue, such as the meninges which cover the brain, the fibrous tissue of nerves,

neuralgia or neuritis, and the fibrous tissue round the teeth, and, further, we may get inflammation of the mucous membranes in the nose, the pharynx, the ears, the larynx, the trachea, and extending down from these into the fibrous tissues of the bronchi, lungs, and pleura, and the same irritation may extend from several of these foci to the glands of the neck. The inflammation of these mucous membranes has been commonly called catarrh, but catarrh is nothing but a rheumatism of the fibrous tissues in the mucous membranes; it is cured by the drugs which cure rheumatism elsewhere, and it is prevented by the diet which prevents rheumatism elsewhere. Similarly, in the abdomen we get local irritation of the fibrous tissues in the stomach, causing catarrh and eventuating in chronic fibrous thickening, in fibrosis, in stricture and possibly even in cancer, and leading directly or indirectly to gastric ulcer, ulceration and perforation. We get like alterations of function in the intestines,

causing flatulence and irregular peristalsis up to colic; the colic produced by lead and other metals being due to a local irritation produced by insoluble urate of lead in the fibrous tissues of the intestinal walls. Similar causation is also acknowledged by most cases of appendicitis or peritonitis, these being, for the most part, a gouty irritation of the fibrous tissues in the walls of the affected part of the intestine, and this, like the catarrh of mucous membranes previously mentioned, is relieved by solvents of uric acid, and prevented by diet which keeps the body free from excess of this poison. In the fibrous tissues of the liver we may also meet with various amounts of irritation running on to fibrosis, or even to abscess of the liver, due, as elsewhere, to local precipitation of uric acid. In the pelvis, we may have irritation of every structure which contains fibrous tissue; in the uterus we meet with all degrees of irritation, with hypertrophy and fibrosis running on to distinct fibromatous

tumour, and in the ovaries we get very similar changes leading to various forms of disease and tumour; all these having an identical causation. In the bladder we see catarrh or cystitis, which, like catarrh in other parts, shows that it is due to uric acid irritation by yielding completely to solvents of uric acid; the prostate suffers in the same way, and uric acid is often the chief cause of the troubles to which it gives rise.

Before I leave the subject of catarrh I will explain that in so far as it may (as in the nose, pharynx and larynx, &c.) be obviously due to microbic infection, it is so merely because this infection found awaiting it a quantity of uric acid in the system which it precipitated on the local fibrous tissues; numerous microbes having this power to some extent. I shall have to speak presently of those of malaria, enteric fever and scarlet fever as exercising this power by precipitating uric acid upon the joints and their fibrous tissues. The point about all catarrhs is

that they are cured by uric acid solvents (such as bicarbonate of soda), which have no antiseptic effect upon the precipitating microbe, and are prevented and practically cease to appear in those who relinquish injurious foods and consequently have no uric acid which the microbes can precipitate into their fibrous tissues.

Just the same considerations apply, I believe, to all microbic diseases, for when microbes find themselves precipitated on, or inoculated into, the tissues of a body where the combustion is slow and poor and the fluids and solids are loaded with waste products, they naturally flourish and multiply in what may be called a pathological sewage farm; while those falling into the brightly burning fire of a quick combustion with fine circulation and small accumulation of waste products are themselves burnt up and cannot produce disease. It seems to me that evidence is steadily accumulating that tubercular troubles, for instance, do not

originate in those who have a sufficient supply of natural foods and are consequently in a state of normal combustion; and that even after tubercle has got a foothold it may be rooted out by feeding up on uric-acid-free foods, which not only make the fire roar up the chimney, but help its combustion as long as they are continued. On the other hand, those who are fed up on the uric-acid-containing foods have an intensified combustion while the stimulation lasts, but later on, clogged by the added uric acid, find even the ordinary standard of combustion impossible of attainment. The tubercle then, if it has not been completely destroyed, is able once more to flourish at the expense of the invaded organism and can complete its deadly work.

Lastly, we come to the most important fibrous tissues in the body, and those in which the action of uric acid as an irritant has been longest known and most completely studied—I mean the fibrous tissues of the joints and their surround-

ings. Hence the local group of uric acid food poisonings is sometimes called the arthritic group, though, as we now see, the arthritic group is part of a much larger whole.

Practically all that has been said about the irritation of other fibrous tissues applies word for word to that of the fibrous tissues of the joints. Uric acid is always precipitated upon seats of local heat or irritation, and as the joints are in constant use, they often, as the result of this activity, offer places in which by a little local heat or irritation the alkalinity of the blood and tissue fluids is slightly diminished; thus there is formed locally a spot in which the uric acid tends to become somewhat insoluble and to be retained or held back, instead of passing on in the circulating fluids.

Then, as we know from the phenomena of the uric acid filter, the uric acid which is first thrown down or retained, attracts to itself more and more uric acid from

the blood and circulating fluids; and thus what is to-day an invisible speck of uric acid becomes to-morrow the size of a pin's head; at the end of a week it may be as large as a marble, and at the end of a few months the size of a Tangerine orange, containing even two or more ounces of urate.

Now it must be obvious that uric acid cannot be in two places at once; that when a deposit of it is taking place, say in the big toe, the blood and tissue fluids of the rest of the body become gradually less and less saturated with uric acid, till they contain very little at all. The result of this is that as any of the troubles of the local irritation group are increasing, the troubles of the collæmic or circulation group are diminishing, and this is the invariable rule. If any one who has suffered from the uric acid headache for years gets by accident a point of local irritation, say, in his toe, this becomes a centre of attraction to the uric acid, and as the deposit there increases the head-

aches become less frequent and less severe, until they almost completely vanish for a time, because the excess of uric acid previously present in the blood stream is for a time getting locked up in the tissues of the toe. And this applies not to one individual instance of the collæmic group, but to every member of that group and to the group as a whole. Any member of the collæmic group can be replaced by any of the local irritation or arthritic group. Thus, to take a well-known instance, rheumatism alternates with chlorosis, or arthritis with depression and dyspepsia, or a man who suffers from gout in his toe may pass urine which is quite free from sugar, until one day the gout in his toe begins to clear up, and is replaced by some troubles of the collæmic group, perhaps accompanied by headache and depression, and with these he begins to pass some sugar in his urine. A converse change is also possible, and if the gout and accumulation of uric acid in his toe return, all

the phenomena of the collæmic group, together with the glycosuria, will again disappear and be replaced by all the phenomena of the local irritation or arthritic group. In the same way the man who has gout and tries to "cure" it by solvents may get relief from his arthritis, but he not infrequently produces the more deadly phenomena of Bright's disease with its headaches, depression and dangers of dropsy on the one hand, or of uræmia and cerebral hæmorrhage on the other. I have seen quite a number of cases even in members of the profession, where the too energetic administration of colchicum had produced some of these serious results.

The only sane and sensible course for a man who has gout in his toe is to cut off at once the supplies of fresh poison, and leave Nature to deal with the accumulations which he already has in his body. This she will at once proceed to do when freed from daily introduction, and the only treatment required will prob-

ably be to administer from time to time small doses of retentive drugs to prevent uric acid from flooding the blood too quickly or continuously. The treatment, however, will vary somewhat with the indications present in the individual case and the external forces in action that favour the production of arthritis on the one hand, or collæmia on the other. The latter is far the more deadly of the two, and a little pain in a joint is a trifle compared with uræmia or cerebral hæmorrhage; while to treat gout with colchicum and continue to swallow ten or twelve grains of uric acid each day can scarcely be described as anything less than suicidal insanity. In this way we can not only understand what has long been known about the alternation of various members of these groups, but we can see exactly what Nature is doing. Further, we can follow, by watching the capillary circulation in the skin, each stage of the process, and, more than this, by the administration of solvents or precipi-

tants, we can produce at pleasure a member, either of the collæmic or of the arthritic group, and change the one for the other at will. Indeed, I very frequently ask patients which they prefer to have, as I know that in curing the one I must produce the other. In serious cases there is, of course, no choice—one must choose that which is least deadly to life, and that is generally a member of the arthritic group.

Looking at this causation of arthritis we can see that there must be two chief forms in which it will be met with; one of acute arthritis, in which the uric acid is driven quickly out of the blood into numerous joints, and a more or less decided rise of temperature results, partly owing to the complete clearance of uric acid from the blood and consequent rapid combustion, and partly also to the local irritation in numerous parts of the body. This is known as acute arthritis, and in certain conditions has been called acute rheumatism, and in certain other condi-

tions acute gout. I have long preferred merely to call it acute arthritis due to uric acid. Here we have an acute trouble corresponding with very marked signs of the absence of uric acid from the blood, and the treatment which will relieve this condition is to bring the uric acid back into the blood as quickly as possible by means of solvents. There is thus a law that all local precipitation diseases are relieved by solvents, and that all collæmic diseases are relieved by precipitants; in other words, by those things which clear the uric acid out of the blood and drive it into the fibrous tissues; these being but two sides of the same process. But there is a second form of arthritis associated with different conditions. The capillary reflux is not quick; it may even be decidedly slow, and there are marked signs of debility and anæmia; these demonstrating the presence of more or less chronic excess of uric acid in the blood.

This form of arthritis or local irritation is really, as regards a part of its course,

a member of the collæmic group. I believe there has been at some time in the past history of the body in question a local precipitation of more or less uric acid, and this local precipitation has acted as a uric acid filter and attracted to itself some further uric acid from the blood stream. In so far as the local irritation is dependent upon the presence of uric acid, it is obvious that the more uric acid coming to this seat of local irritation the greater will be that irritation. Take a blood which is full of uric acid, and tissues which are more or less thoroughly saturated with it; in conditions of debility and anæmia you will get a constant large quantity of uric acid present in the circulation, and there will consequently be a constant supply of fresh uric acid to the various seats of local irritation. The irritation thus fed and increased is the trouble commonly called chronic arthritis or chronic rheumatoid arthritis, and one specially associated with conditions of collæmia, subnormal temperature, debility, and anæmia.

This then is a member of the collæmic group and, like all other members of its special group, it can be cured by precipitants, which bring about a cure by clearing the blood for a time of excess of uric acid, so that it is unable to bring further uric acid to the seats of local irritation, and this irritation therefore gradually subsides. But I must not fail to point out that both these forms of arthritis are associated at one part of their course with excess of uric acid in the blood. An acute arthritis cannot be produced unless there is an excess of uric acid in the blood to be driven into the joints. Hence those cases of arthritis associated with very little uric acid in the blood are none the less due to precedent uric acid and are consequently completely prevented by a uric-acid-free diet. But in the chronic arthritis associated with collæmia it is important to remember that debility, which keeps a constant supply of uric acid in the blood (by keeping the blood in a condition to dissolve it), is our

worst enemy, and we must not so alter our diet as to produce an increase of debility or we shall make the trouble worse. In this case the first points to attack are the debility and anæmia (by means of tonics and feeding up on any diet), and when the patient is re-established a slow and careful change to a uric-acid-free diet will consolidate the cure and render it permanent.

The uric acid troubles in the fibrous tissues of the heart commonly called endocarditis and pericarditis and ascribed to the unknown factor rheumatism, have really an identical causation with the uric acid irritation in the fibrous tissues of the joints which we have just been considering. Excess of uric acid in the blood causes, as we have seen, a very considerable addition to the labours of the heart in driving the blood forward through the capillaries into the veins. When, under this increased strain, the fibrous tissues in the valves of the heart become seats of diminished alkalinity, uric acid is precipitated into them in exactly the same

way as into the fibrous tissues of the joints, and this is the reason why joint troubles and heart troubles are so very commonly met with together. In the valves of the heart also we get first a small irritation, then a small precipitation of urate, and in succession a further extent of irritation and a further precipitation of urate, till a comparatively large tract on the surface of any valve is involved in the urate irritation. This, I may mention in passing, practically always affects the valves of the heart which are most exposed to pressure and strain, just as outside the heart uric acid is always precipitated on all those joint structures most in use or most subject at the particular time to pressure, injury, or strain. Once a lesion has been produced on the valves of the heart, this lesion, like that in any of the joints, may act as a uric acid filter, attracting more and more uric acid to itself for days, weeks, months and even years. People are much too apt to imagine that an attack of endocarditis

having once originated and been treated by solvents is over and done with for ever. This is very rarely the case, for if solvents are not given for a sufficient length of time to extract all the uric acid from the damaged tissue, further quantities of uric acid are certain to find their way there, with the hourly and daily fluctuations in the amount of uric acid and its solubility in the blood and tissue fluids. In this way it comes about that what was at first a microscopic nodule of irritation on a valve, becomes gradually a widespread roughened surface with more or less hypertrophy of the fibrous tissues, and this irritation continued and kept up for weeks, months and years, eventually ends in a contracted or even calcareous mass of fibrous tissue, such as we find in the last stage of what is known as the "button-hole mitral valve." What we learn from this natural history of endocarditis is, I think, that the only safety from its continued progression lies in the complete removal of the original

focus of uric acid precipitation, and in the careful guarding of that focus from further precipitation in the future by means of solvents and the diet which excludes excess of uric acid from the body.

What I have said about endocarditis applies practically word for word to pericarditis. Here also, in the conditions which obtain when there is excess of uric acid in the blood, we get pressure and strain and its results, for it is the fibrous pericardium which restrains the heart muscle from bulging and giving way before the high blood pressure in the vessels, and it follows that in all conditions of high blood pressure (especially when these are associated with athletic exercises or other strains on the muscular system) we get pressure and strain on the fibrous tissues of the pericardium. There may then, as the result of this, be set up in various parts of these fibrous tissues foci of irritation on which uric acid is precipitated, and in which it may afterwards, by uric acid filter action, keep up a chronic and recurring irritation.

Precisely the same applies to the fibrous covering of the lungs—the pleura. This also is liable to pressure and strain or may be affected by irritation in the neighbouring fibrous tissues of the lungs, or in the fibrous tissues of the chest walls in contact with it. As I have shown above, irritation in this fibrous membrane from any of these causes may lead to its becoming a focus of uric acid precipitation, and thus to the chronic and recurring troubles which I have described as taking place in other tissues.

We have this interesting fact also to record with regard to the pleura, namely, that an inflammation there may undoubtedly be set up by local exposure to cold. A man who is perspiring after exertion sits for a few moments on the top of a wall, and one side of his chest is exposed to the wind. He has excess of uric acid in his blood, because he has been working, and the work and perspiration have rendered the blood a good solvent of uric acid. The action of the cold is to

precipitate locally some of this uric acid on the pleura, and a focus of uric acid precipitation and of pleurisy is thus set up. We have here then the exact parallel of the causation of uric acid irritation in the fibrous tissues of joints, for these joints may be affected in exactly the same way by exposure to cold in sequence to fatigue and perspiration.

Before I leave the subject of local irritation by uric acid I would point out a fact which it is well to bear in mind; namely, that uric acid is a cause of more general and widespread irritation in all the fibrous tissues of the body than any other known substance, and that, as I have for some years suggested, uric acid may thus be the precipitating cause of that terrible disease cancer, which is apparently increasing so markedly at the present day. Cancer is well known to occur with great readiness in seats of irritation due to various causes, and it has long seemed to me that uric acid may not only furnish many seats of irritation in which cancer

may originate, but that in so far as statistics are to-day available, we find cancer increasing side by side in strict parallelism with nearly all the troubles which I have been pointing out as due to food poisoning by uric acid. Further, I think it is very distinctly shown that in those races consuming least uric acid in their daily food cancer is almost unknown, and in those portions of Great Britain where least uric acid is contained in the usual foods, there is also by far the smallest death-rate from this cause.

Cancer may be but one more instance of the action of a microbe or external parasite, but it seems to me highly probable that this has its way paved for it by the widely spread local irritation which uric acid produces, just as is undoubtedly the case with some of the microbes previously mentioned.

Certainly these evils are growing—catarrh, influenza, rheumatism, appendicitis, morbus cordis, cancer. Science may well multiply cures, for there is a steady increase all along the line of suffering.

At the end of the last chapter in which I describe the disturbances of function, nutrition and structure, which food poisoning by excess of uric acid produces, it seems right that I should say a few words on diagnosis, for it is of the very essence of my argument that those troubles which are due to uric acid will be relieved by removing it, and will be prevented by continuing to withhold it. If, therefore, we have to deal with a local lesion accompanied, let us say, by a definite rise of temperature, and if that irritation and rise of temperature are not affected by solvents of uric acid properly administered, then such local irritation is not due to uric acid, and some other cause should be sought for. If again any local irritation more or less combined with a general condition of defective combustion is not affected either by solvents of uric acid on the one hand, or precipitants on the other, and is in no way hindered or prevented by such changes of diet as suffice to keep

the blood moderately clear of uric acid, then that local irritation or general defect in nutrition and combustion is not due in any way to uric acid, but other causes, such as tumours or malignant growths, will probably be found to explain the conditions. Uric acid is not only a cause of all the disturbances which I have described, but it is a cause which can usually be identified with absolute certainty in a few moments, and the results of treatment by drugs and diet are as a rule perfectly conclusive, so that in any case where conclusive results are not obtained the diagnosis requires reconsideration.

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night and morning, say at 8 a.m. and 10 or 11 p.m.), will find that in the morning it is slow as 6 half seconds or more, and that in the evening it is quick as 4 to 5 half seconds,[1] and drawing a curve to join these two points you will get an orderly series of ups and downs; the ups corresponding to the mornings and the downs corresponding to the evenings. This is the ordinary curve of the circulation of the blood as produced by the controlling action of uric acid in conditions of physiology. The reflux is always slow in the morning hours because at those hours the blood is in the best condition to hold uric acid in solution, and consequently contains most of it; and is quickest in the evening hours because at that time the blood is less alkaline, is less capable of holding uric acid in solution, and consequently contains less. Now the

[1] These figures are for those who are free from great excess of uric acid. Meat eaters or tea and coffee drinkers will be slower as 8, 9 or 10 in the morning.

quickness of the capillary reflux in the evening hours is dependent on the amount of uric acid in the blood—the less the uric acid in the blood the quicker the reflux. The reason the uric acid is not in the blood in the evening is because it is held back in some of the great viscera or fibrous tissues of the body, and not because the body as a whole is poor in uric acid. Therefore the uric acid thus held back at night must pass into the blood next morning, when it becomes in the natural course of events a good solvent of uric acid, and the more uric acid held back at night, the more there will be available for solution in the blood next morning. A very quick reflux at night therefore means a proportionately slow reflux in the morning; and on the other hand, a relatively slow reflux at night means a relatively quick reflux in the morning; for if the uric acid is being freely excreted at night less is available to come into the blood in the morning. Hence we see that with large

fluctuations of the curves (high in the morning and low in the evening) we are getting retention of uric acid in the body; on the other hand, when the curves are small, when the capillary reflux is at or below 6 in the morning and not below 5 in the evening, there is a free excretion of uric acid, and it is not being retained anywhere in the body.

By means of drugs we can reproduce either of these conditions, and we can not only reproduce them, but we can make them much more marked. By administering precipitants, or things which form insoluble compounds with uric acid, we can increase the evening fall of the curve, and if the precipitant is then dropped we shall get a corresponding rise in the morning end of the curve; that is to say, we shall be able to tell that we are retaining uric acid in the body and increasing the amount that passes through the blood in the morning hours, because we diminish the amount that passes through the blood in the evening hours.

Conversely, by giving solvents of uric acid we can slow the reflux in the evening hours, and make the curve in a few days almost into a straight line, by equalising the amount of uric acid that passes through the blood in the morning and evening. We increase the amount that passes through in the evening, and thus diminish the amount available to pass through next morning. Hence it comes about that if alkalies or salicylates are continued for a few days, the solvents gradually reduce the range of the curves till eventually they differ but little from a straight line, and the capillary reflux is practically the same, both morning and evening. I need perhaps hardly explain that if precipitants are continued day and night for several days, we get a larger holding back of uric acid, demonstrated by varying daily fluctuations and by a considerable rise, especially of the morning end of the curve. When the precipitant is dropped those who suffer from the uric acid head-

ache or any other well-marked effect of collæmia, will find their trouble greatly increased the first or second day after the action of the precipitant ceases, and there will be a marked slowing of the capillary circulation and a rise of the capillary reflux curve both in the morning and probably also in the evening, this corresponding to the amount of uric acid that has been retained in the great viscera or fibrous tissues but is now available for absorption into the blood.

In pathology we meet with exactly similar fluctuations in the capillary reflux curve, but the changes with which we have to deal are greater and more extensive in either direction. In diseases of the collæmic group we shall get capillary refluxes far above six half seconds, up to twelve, fifteen, and even twenty half seconds in Bright's disease, diabetes and associated conditions. On the other hand, in fever, another pathological condition, we get capillary refluxes which are, as a rule, quicker than any we

meet with in physiology and quicker also than almost any which can be produced by drug action, for fever clears the blood of uric acid more completely than any drug. But here in conditions of pathology also we see the same morning and evening fluctuations. In Bright's disease and diabetes the capillary reflux is always slower in the morning and quicker in the evening, and in fever the rapid reflux is quicker still in the evening and tends to be somewhat slower in the morning.

In these curves of capillary reflux, we have an index in the normal curves (from four and a half to six half seconds) of normal combustion and metabolism, and this will be found with certain signs in all the organs and tissues. In the slow capillary reflux of six to twelve, or twenty half seconds, we have an index of abnormally slow combustion, and we shall find the signs of this also in all the tissues of the body and in their excretions. On the other hand, in the abnormally quick refluxes of fever we have the index of

abnormally increased combustion in all the organs and tissues of the body and the same will be found in their excretions. Then, throughout the defective combustion group we get in the urine diminished urea because albumen is incompletely metabolised, but we find in its place an excess of albumen or an excess of sugar, or both together, because these things have been left untouched by the metabolism, and we may then find that there has been a similar incomplete combustion of fat and that this has been deposited in excess in the patient's body. In fever, on the contrary, an increased excretion of urea is observed because an excess of albumen has been metabolised, and when fever supervenes upon a condition of defective combustion which was previously producing either albumen or sugar in the urine, the albumen or sugar diminish just in proportion as the combustion is increased. The rise of urea tells us in such a case how much more albumen has been metabolised, and we find a

corresponding fall in the amount of unmetabolised albumen in the urine.

It follows from what I have previously said about the curve of capillary reflux in physiology, that just as the uric acid held back in the evening hours increases the uric acid available in the morning hours and then slows to a proportionate extent the capillary reflux, so also must the uric acid held back and retained in the early stage of a fever return into the blood and slow the capillary reflux, diminish the combustion, and lower the temperature when the fever has passed off. The one condition is absolutely the result of the other and is always in my experience proportional to it. Thus five to seven days of sharp fever in pneumonia are always followed by about a corresponding number of days when the capillary reflux is very slow, combustion defective and temperature subnormal. We can also see in this causation a complete explanation of the fact that the defective combustion of

albumen which has been called Bright's disease so often originates in the period of defective combustion which follows such fevers as scarlet fever, pneumonia and malaria. The condition of defective combustion known as Bright's disease is the result of the holding back (retention) of uric acid in the fever and of its rushing into the blood and slowing combustion as the fever passes off.

The amount of uric acid in the blood at any time can thus be ascertained by eight or nine separate and different observations. It is discoverable by the rate of the capillary reflux; we can tell it by the temperature which is subnormal in collæmia, with its slow combustion, but is raised in retentive conditions with their quick combustion. It can also be told by the relation between the temperature in the mouth and that in the internal parts of the body such as the rectum, for when uric acid blocks the capillaries we have already seen that it blocks chiefly those on the surface and at the extremities, because

cold is a precipitant of uric acid and these are more liable to be affected by cold. In other words, uric acid is better held in solution in the blood stream when that stream is at its normal temperature. It follows from this that in all conditions of collæmia the heat is shut in, as it were, into the deeper parts of the body; for there is thus less than the normal transpiration and perspiration from the skin. Hence though the surface temperature may be lowered, that in the rectum is raised, and the further these two temperatures are apart the greater is the obstruction of the circulation and the greater the amount of uric acid in the blood. Therefore in physiological conditions the temperatures in the mouth and rectum are always further apart in the morning hours up to 2 p.m., and nearer together in the evening hours; and in conditions of pathology the two temperatures are close together in fever and wide apart in collæmic diseases and in all conditions of defective combustion, such as

Bright's disease, diabetes, and respiratory diseases, which latter directly diminish the available oxygen (and so the combustion power of the body) and increase the quantity of uric acid held in solution in the blood. These two temperatures are also driven further apart by exercise, which makes the blood a better solvent of uric acid, and, where uric acid is available, increases the amount held in solution in the circulation. Thus those who have most uric acid in the body have the most divergent temperatures in exercise and fatigue, and those who have lived on a uric-acid-free diet have temperatures which are comparatively little affected by fatigue. It is therefore obvious that in any trial of endurance those whose superficial and deep temperatures are least divergent in exercise will have least friction in the machinery, and consequently are most likely to win in any trial of endurance. And it is owing to the absence of friction in the machinery of which the temperatures in the mouth

and rectum are thus an index, that vegetarians have so often triumphed in athletics over their meat-eating and tea-drinking opponents. Again, by means of drugs, the temperatures in the mouth and rectum can be made to approach or diverge from each other according as uric acid is diminished or increased in the blood.

The third means by which the amount of uric acid in the blood can be ascertained is by measuring the blood pressure, but I need not go into this again. The fourth is the blood decimal, which, as I have shown, varies from morning to evening with the amount of uric acid in the blood. The fifth is the quantity of water passed in the urine, and this is controlled by the amount of colloid uric acid blocking the renal capillaries. Hence the renal excretion of water is the index of the amount of uric acid in the blood; the water increasing when uric acid falls, and diminishing as uric acid rises. The sixth means is the amount of uric acid in the urine, which again is always more

in the morning hours and less in the evening hours. The seventh is the amount of water excreted from the lungs in expired air, for this, as I have shown, is controlled by uric acid in exactly the same way as is the water from the kidneys; and the eighth is the examination of the blood itself for the amount of uric acid it contains, as shown by the number of granules that can be precipitated in it by chloride of ammonium, and these also are always more numerous in the morning and less numerous in the evening. Lastly, there is one more (though it is not available for purposes of demonstration, as it depends on the observation of the individual worker), and this is by taking the rate at which the "fatigue image" in the retina disappears, for before I made use of the capillary circulation in the skin I found out that the fatigue image always disappears more slowly in the morning and more quickly in the evening, and is in every way a correct index of the rate of the capillary

circulation, and so of the amount of uric acid in the blood which controls it.

Clinical workers have only to bear in mind that all collæmic diseases are relieved by substances which precipitate uric acid and clear it out of the blood, and all diseases and disturbances of function due to precipitation of uric acid are relieved by solvents. Conditions affected by neither of these are not due to uric acid. The prevention of all these changes, and the cure of local lesions (so long as this is possible) can only be obtained by withholding uric acid from the food and thus diminishing the daily turnover of this substance from perhaps 20 grains or more to 10 grains or less. This course and this alone will ultimately remove the physical and mental perversions brought about by the xanthin or uric-acid-containing foods in common use.

CHAPTER VII.

Prevention and Treatment of Food Poisoning.

It is obviously absurd to try to stop the results of food poisoning while continuing to swallow the poison; it is still more foolish, and may be dangerous, to try to wash out the poison while continuing to pour it in. With regard to this washing out, I have shown that the uric acid, which controls the circulation, controls the outgoing of the water; the water on the other hand having little or no control over the excretion of uric acid. An attempt to wash out by excess of fluid is therefore useless, and may be dangerous, because the water which cannot pass out through the obstructed capillaries of the kidney, remains in the body, either in the stomach which it dilates, or in the blood-vessels

which it also dilates, and in which it therefore raises the pressure and so increases the work of the heart. All this is bad physiology, bad practice, and the results are often disastrous. The only sane and sensible thing to do, when the cause of these troubles has been discovered and it is realised that they are due to uric acid poisoning, is to give up the foods that introduce it. Prevention is better than cure, and if this is understood it follows that there is no necessity at any time to suffer from diseases which, call them what you will, are but the varying effects of one and the same poison.

There is, I believe, no real cause to doubt that man is essentially a frugivorous animal, and that the foods natural to a frugivorous animal are those which suit him best. The natural foods of this order of animals are nuts and fruits, and these (as eaten by them) practically contain no uric acid. It thus appears that my discovery that uric acid has produced many poisonous effects hitherto wrongly

ascribed to other causes, is founded upon "the solid ground of Nature," for in the foods natural to man there is no uric acid or its equivalents. The means of prevention, therefore, of troubles due to food poisoning by uric acid is to keep the human animal, at all times and under all conditions, on his natural foods. In youth these foods are milk, fruit and nuts, the last-named being added as he gets his teeth and is thus enabled to deal with them. I see no cause to doubt that an *adequate supply* of these natural foods, given to man from the beginning of life, will produce the most magnificent structure and perfect function of which his body is capable.

The cure of these so-called diseases is another and quite different matter; we have now to deal with structure and function from an altogether different standpoint. Instead of natural conditions there are conditions more or less altered and debased by years of poisoning, altered nutrition, and eventually altered

structure. To feed such a man is a totally different matter from deciding upon the best foods for him in his natural state and before function and structure are perverted.

In Nature there is no forgiveness of sins, nor indeed can we imagine such forgiveness possible. The man who has rotted and destroyed his teeth by constant contact with the fibrous tissues of fish and meat for which they were not intended, is not the least likely to obtain a new set. And he who has produced atrophy of the mucous membranes of his digestive organs, or has suffered a similar atrophy of the skin as the result of defective circulation and defective nutrition caused by food poisoning extending over years, is not the least likely to obtain new organs and structures, nor to be in the position which would have been attained if he had lived all his life on natural foods. When we come to deal with this diseased and atrophied structure a much more difficult problem is pro-

pounded than in deciding on the natural foods of man as a frugivorous animal. We are faced by inevitable compromise; this man, injured by years of mistaken feeding, cannot take the natural foods, but must do the best he can to reduce the intake of uric acid and to make use of such foods as his altered structure still permits. But even here, when Nature gets fair play she will do her best, and though it is impossible for her to restore structures which have disappeared or atrophied to one-half their original size, all possible restoration will be made and life will at worst be very much better for such a man if he relinquishes all fresh introduction of uric acid. The foods available are those I have already mentioned as being the natural foods, but in so far as it may be impossible for him to take nuts or to digest them, owing to destruction of teeth and impairment of digestive organs, he must find something which will more or less take

their place and yet be free from uric acid poison. Bread is perhaps the best substitute open to him. I do not regard this as the natural food of man, it is a compromise or substitute, but when super-cooked, its constituents much resemble in their altered form those of fruit, which is one of the natural foods. He is thus able by means of bread to get sufficient nourishment and of a kind generally possible for him to assimilate with comfort and in sufficient quantity. While milk and its product, cheese, are part of the natural food of the young animal, they can scarcely be regarded as natural foods for the adult. Man has, however, got himself into difficulties with regard to the food question, and must to some extent compromise and continue to take milk and cheese, more or less permanently, since there is no getting over the necessity that a certain quantity of albumen must be consumed day by day in relation to his body weight. The compromise, there-

fore, consists in choosing such foods as introduce least of this substance, but, as I have said before, if uric-acid-free foods can be taken in the proper proportion required by body weight and activity, there will be produced the highest development of body and mind, for mind is, after all, but a function of the body, and what a man eats controls the circulation in his brain. What he eats he thinks, and what he thinks he eventually becomes. On the other hand, no one swallows uric acid with impunity; in all it slows the circulation and causes deterioration of the blood, and these two processes continued lead inevitably to physical and mental decay, increasing and extending until it becomes a national as well as an individual danger.

We have also with regard to treatment to consider the quantities of food which a man requires, and before going further I may say that I believe children brought up on natural foods will eventually find out for themselves by natural processes

the amounts they require of these foods though in the present day, where ignorance is so great and error has long been so prevalent, it is not safe to bring up children on natural foods without watching carefully to see that they gradually increase in weight, that their blood condition keeps good and steadily improves, and that their circulation is and remains perfect. But if these points are kept in mind I believe all children may be reared on the foods natural to a frugivorous animal without fear or failure.

To return to the foods required for an adult who has been subject for years to the evil effects of food poisoning, we have to bear in mind two facts; first of all that he requires a definite quantity of food (albumen) in relation to his body weight and to his activity, and second, that he must get that food from such sources as practically contain no uric acid. The quantity in any given case is easily arrived at by the following calculation. Take the body weight in pounds and multiply this by 9

in the case of those who lead ordinary lives, and by 10 in the case of those who are quite young and still developing as well as leading active or decidedly active lives. The result of this multiplication is the amount in grains of albumen required to be taken by that individual each day. Thus a man of 140 lbs. weight who leads a moderately active life will require 1,260 grs. of albumen each day. The problem is to get this quantity of albumen from foods which he can digest, and which practically contain no uric acid, and the foods available are bread, milk, cheese, bread stuffs (including all kinds of grain foods) and nuts, with dried fruits, fresh fruits and vegetables as sauces to the foods. All these things are available for him, and the point to be borne in mind is to take those which are liked and which his powers of digestion best enable him to deal with. If he has few or bad teeth he will not be able to manage nuts, and to a certain extent dried fruit will present a difficulty.

For such a man it practically comes to this, that he is able to eat each day a certain given quantity of bread, and he must make up with milk and cheese the amount by which this bread falls short of the total albumens required; he will also get a small quantity of albumens from the dried fruit, fresh fruit and vegetables which are to be regarded as sauces to the bread stuffs. If, for instance, he takes bread and bread stuffs equal to 560 grs. of albumen a day, he will require to get 700 grs. of albumen a day out of milk, cheese, dried fruit and fresh fruit and vegetables, or he may get 700 grs. out of bread stuffs and 560 grs. out of the rest. This is the whole problem, and it is obvious that it may be solved in different ways to suit many different tastes and conditions of structure and function. Much will depend upon the amount of wreckage produced by the uric-acid-containing foods, and the stage of degeneration in the individual in question. If his teeth and digestive

organs have not been already ruined so much the better for him; he can take some nuts and a good deal of fruit, especially in summer and when living an active or hard working life.

It is advisable that I should here lay stress on observance of the rule just given for the quantity of albumen which must be taken to produce the best results. It is asserted in several authoritative quarters at the present time that we eat too much, and that the old physiological standards of quantity may be lowered. This is not my opinion, nor has it been my experience. Those who study Professor Chittenden's recent experiments with men of various ages and degrees of activity will observe that the quantities he gives are but little below my standard, and that where they fall short of it I believe the eventual, if long deferred, result would be unfortunate and even dangerous. I say "long deferred," for where quantities are only slightly below the standard the consequences might be impossible to

realise until they had been watched for periods of from eighteen months to two years. If underfeeding is continued, and defects of circulation, blood colour and temperature are accentuated, there will eventually come a time when those who thus persist are within range of debility and collapse, and meanwhile they will have run considerable risk from the attacks of the many microbes of which the under-nourished individual is the ready prey.

With regard to bread and bread stuffs I have indicated that they are not in the first line of man's natural foods, but that by cooking they can be made to resemble the more natural foods, such as fruits, and it is therefore practically always necessary for a man who has been depraved by wrong diets to supercook his bread stuffs. Supercooked bread stuffs are bread which has been toasted through and through, and not merely on the surface. This is best prepared by cutting a loaf into thin slices and putting it again into the oven.

Rusks and biscuits, especially if these are given a little extra cooking, may be regarded as supercooked bread stuffs, and all kinds of puddings and porridges may be supercooked by simply continuing the cooking process for a whole day instead of for an hour or two. If these rules are attended to, much of the dyspepsia which bread produces in so many people, and which they endeavour to avoid by falling back upon a larger supply of meat, may, I believe, be prevented: and with advantage, for to go still further from Nature, and attempt to become a completely carnivorous animal, is a dangerous process. But I must refer for greater detail on this branch of the subject to the larger work, of which this is an epitome, or to the little book on "Diet and Food," in which these problems are considered at greater length. I will only say here in concluding this outline, that all can see the reality of the conditions I have described if they are at the trouble of gauging the capillary circulation, of watching and estimating

the condition of the blood, and of observing their own capillary circulation and blood condition day by day and week by week. When they have understood these things they will be in a position to rectify their diet, and will see for themselves the resultant improvement in these matters. I have no doubt that man is a frugivorous animal and that his sufferings result from losing touch with Nature. The immediate effect of the poison in flesh has led him to mistake stimulants for foods, and to travel ever further in the direction of stimulant poisons (such as alcohol, tobacco, opium and cocaine), from which there is no return. Nature heeds no excuses and visits on all alike the results of their wrong-doing, whether ignorant or wilful. In this ignorance I myself shared up to twenty-four years ago, and I have only made my way through it with much difficulty and after many failures.

Practically no drugs, Spa waters, massage, electrical or movement cures, are of real use; they do not affect the

cause, but only influence some of the results for a time. With one or two exceptions they do not even aid the elimination of uric acid from the body, but like all tonics and tonic treatment, bracing climates, &c., they rather tend to store it up.

Those treatments are worst of all which by meat, meat extracts, soups, and the deadly drug caffeine (which is practically uric acid itself), not only do not aid elimination but increase introduction and bring about its precipitation and retention in the previously existing local stores and deposits.

They may clear the blood for a time by producing this precipitation, and thus temporarily relieve troubles of the collæmic group, but such action is at best temporary, and everything must be worse later as the quantity of poison in the body is increased.

Heat is a remedy which may aid elimination, increasing for a time troubles of the collæmic group while relieving those of the arthritic group; but it must

not be used in such conditions as debility, especially if complicated with cardiac weakness, in which the collæmic troubles are already threatening and may easily become serious.

Cold, on the other hand, may relieve troubles of the collæmic group, but tends to hold back uric acid in the body and tissues, and may thus precipitate troubles of the arthritic group.

It follows that there is no real cure except to withhold the poison, and if this is attempted on the right lines Nature will do the rest if she is given time, and will eventually accomplish as much cure as is possible in the nature of things.

Meanwhile the truth of these conclusions is daily demonstrated by those who in refusing to accept them afford an object-lesson which will become the more convincing as time proceeds and the effects of the poisons taken in food accumulate.

Some are disposed to blame the medical profession for their apathy in the matter. This I consider unjust. Members of the profession are themselves suffering from

the same causes and are neither more healthy nor longer-lived than the general public. They cannot impart knowledge they do not possess, nor transfer an experience which has never been their own. I am inclined to go further and to say that those who themselves practise the uric-acid-free diet are possibly judicious in exercising reticence on the matter with the greater number of their patients, for so high have prejudice and party feeling run on what should be a question of pure science, that it is probable they might in many cases injure their own usefulness without benefiting those whom they desire to serve.

We are now only in the dawn of this truth. That it will eventually be recognised I cannot doubt, but the noonday light may come in some catastrophe of national inefficiency and degeneration when, for practical purposes, it may be too late. It will then be an arid consolation to know that the voice of warning was raised though it passed unheeded by the many.

INDEX.

A

ALBUMEN, the necessary quantity, 142, 146
Albuminuria, its causation, 42, 66
Anæmia, causation of, 88
Arthritic symptoms, their causation, 3, 5, 13
Arthritis alternates with anæmia, 109
„ „ „ Bright's disease, 110
„ „ „ glycosuria, 109
„ always preceded by collæmia, 114
„ two chief forms of, 112
Asthma and the circulation in the lungs, 70
Athletics, effects of collæmia upon, 95

B

BARKER-SMITH, Mr., his method of estimating uric acid in the blood, 11
Bladder, catarrh of, 104
Blood, annual variation in quality, 91
decimal, the, 21
„ „ relation to standards of colour, 21
„ diurnal variation in quality, 91, 137
„ effect of collæmia upon, 89
„ granules of uric acid in, 12
Bread, a compromise food, 145
Bright's disease, relation to fever, 134

C

CANCER, uric acid a cause of, 121
Capillary circulation, 13, 15, 16

Capillary reflux, 12, 37, 125, 128
„ in pathology, 130
Catarrh, its causation, 102
Children, feeding and rearing of, 142, 146
Chittenden, Professor, reference to experiments, 150
Classification of uric acid poisonings, 47
Clinical worker, the, and uric acid problems, 125
Cold, its action, 155
Collæmia alternates with local irritation, 109, 110
„ and digestion, 70
„ „ eye changes, 61
„ „ the nutrition of the skin, 67
„ chief signs of, 92
„ effect on the blood, 88
„ „ „ heart, 63
„ „ kidneys, 72
„ „ „ lungs, 69
„ „ „ muscles, 76
„ „ „ nerves, 77
„ „ „ vessels, 83
„ explanation of, 53
Collæmic face, the, 59
„ group, 14, 18, 53
„ „ troubles are deadly, 110
Coma, causation of, 87
Combustion, defective, 39, 43, 85, 131

D

DEGENERATION, 94, 97, 143
Diabetes, causation of, 86
„ relation to increased combustion of fever, 88
Diagnosis of uric acid troubles, 123
Digestion, effects of collæmia on, 70
Dropsy, causation of, 73
Dyspepsia, causation of, 70

E

EPILEPSY relation to headache, 56

FATIGUE, its causation, 76
Fever, causation of, 44
„ circulation after, 133
„ „ in, 94
„ effect in production of Bright's disease, 134
„ excretion of urea in, 132
Food, necessity for adequate supply of, 146, 147, 150
„ poisoning, 14, 15
Foods available, 148

G

GANGRENE, causation of, in Raynaud's disease, 68
Glycosuria, causation of, 42, 66, 86
Granules of uric acid in the blood, 12
Gravel, causation of, 74

HEADACHE, the periodic, 2, 10, 23, 56
„ „ its relation to the excretion of uric acid, 3, 4
„ relation to blood pressure, 6, 55
Heart, cause of irritation in fibrous tissues of, 116
„ progressive irritation in, 117, 118
Heat as a remedy, 154
History, 1
„ summary of chapter, 23

I

INSANITY, causation of, 97

J

JOINTS, irritation of, 106

K

KIDNEYS, action of collæmia upon, 73
„ excretion of water from, 72

L

LIVER, chill to, causation of, 71, 72
Local irritation group of food poisonings, 100
Lungs, circulation in, 69

M

MAN a frugivorous animal, 141, 150
„ his natural food, 141, 142
Mental depression, 56
Metabolism, effects of uric acid on, 35
Microbes, their action in precipitating uric acid, 104
Muscles, effects of collæmia on, 76
Milk as a food, 145

N

NERVES, effect of collæmia on, 77

O

OBESITY, causation of, 43

P

PAROXYSMAL hæmoglobinuria, 78
Pelvic organs, effects of collæmia on, 75
„ „ „ uric acid on, 103
Pericardium, irritation of, 119
Pleura, irritation of, 120
„ „ effects of exposure to cold, 120
Poisonings by uric acid, A group and B Group, 47, 49, 51
„ „ collæmic group, 53
Prevention of food poisoning, 140, 156
„ the only real treatment, 155

Prostate, irritation of, 104
Purpura, causation of, 81

Q

QUANTITIES of albumen required for a day's food, 147

R

RAYNAUD'S disease, 8, 67, 78
" " capillary reflux in, 8
" " causation of gangrene in, 68
" " relation to paroxysmal hæmoglobinuria, 78
" " why affecting surfaces and extremities, 66

S

SEASON, relation of uric acid poisonings to, 31
Skin, effects of collæmia on, 67
" " uric acid on, 101
Stimulants, effects of, 20, 96
" " salicylates in aiding their abandonment, 20
" " mistaken for foods, 96, 153
" " the sequence of, 96
Supercooked bread stuffs, 151

T

TEMPERATURE, raised, its cause, 44, 45
" subnormal, its cause, 44
Thrombosis, causation of, 80
" relation to gout, 80
Tonics, their bad effects, 154
Treatment of food poisoning, 140, 141

U

URIC ACID a cause of high blood pressure, 7, 23
" " amount in urine and in blood, 10

Uric Acid as a cause of defective combustion, 35, 36, 40, 46, 84
" " " " stimulant taking, 19
" " " colloid obstructing the vessels, 15
" " " local irritant, 32, 46
" " can be seen by its effect on the circulation, 16
" " effect of administering, 16, 17, 18, 32, 94
" " effects on circulation and metabolism, 35
" " equivalent to xanthin, 52
" " filter, the, 17
" " formation of, 26
" " in blood, methods of estimating, 134
" " its physical properties, 26, 27, 34
" " never swallowed with impunity, 16, 146
" " of introduction, 26
" " poisonings, groups of, 47, 51
" " " production of, 16, 17, 26, 52
" " relation of solubility to times of day and year, 30, 31
" " solvent powers of blood for, 19

V

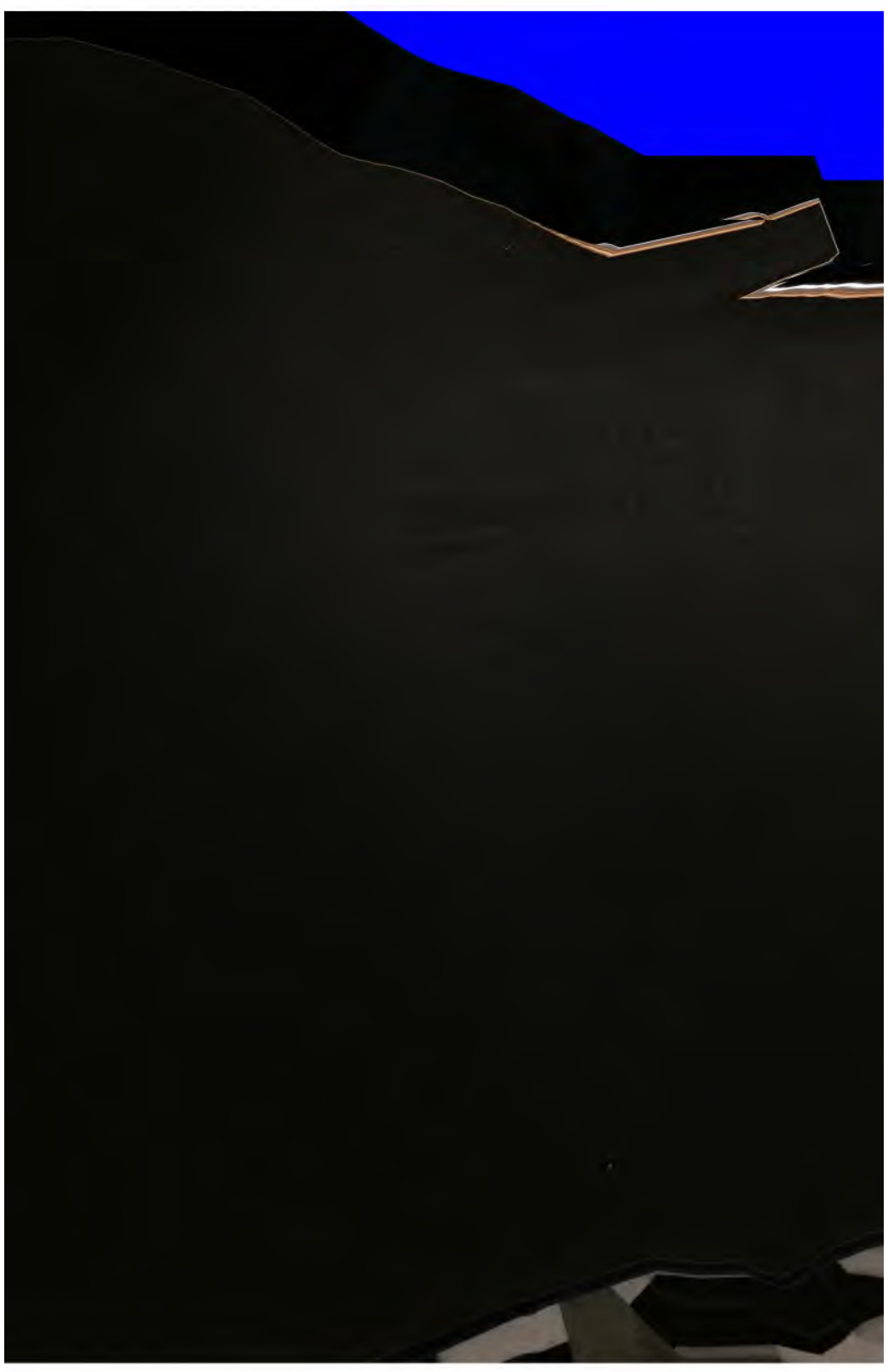
VERTIGO, 56
Vessels, effect of collæmia on, 8

W

WATER in urine, relation to uric acid, 72, 73
" from the lungs, relation to uric acid, 69, 74

X

XANTHIN, demonstration of its poisonous effects, 52
" equivalent to uric acid, 33
" quantities in various substances, 33



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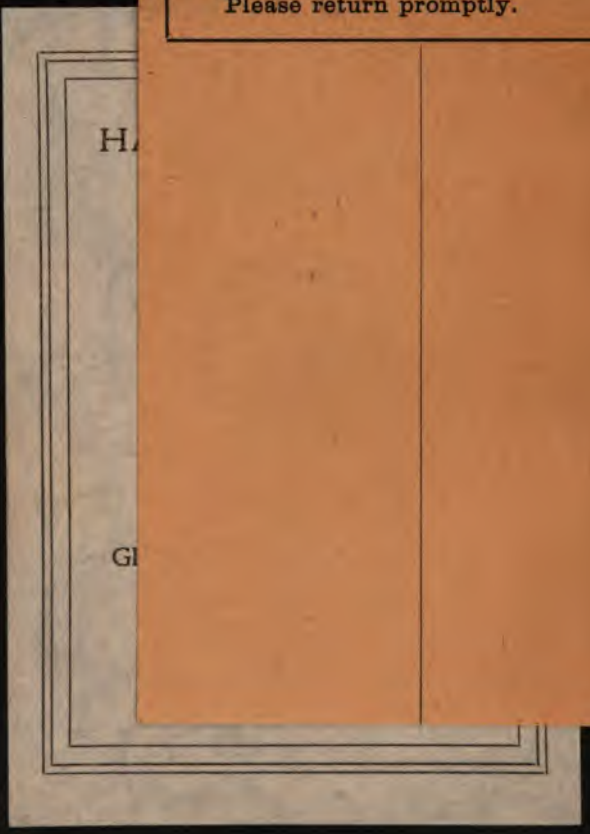
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